User Manual

Maritime Slim Line Touch Panels

Part Number:	80860.732
Version:	2
Date:	2010-12-01
Valid for:	TPM11AM TPM11AT TPM21AM TPM21AS TPM21AT TPM35AM TPM35AT TPM43AT TPM57AM TPM57AT TPM70AT TPM90AT TPM104AT TPM105AT TPM120AT TPM151AT

Version	Date	Modifications
1	2007-09-14	First Edition
2	2010-12-01	Upgrade devices: TPM35AM, TPM35AT, TPM43AT, TPM57AM, TPM57AT, TPM90AT, TPM105AT, TPM120AT, TPM151AT

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
This symbol is used to refer to instructions which, if ignored or not carefully followed, will result in death or serious injury.

WARNING
This symbol is used to refer to instructions which, if ignored or not carefully followed, could result in death or serious injury.

CAUTION
This symbol is used to refer to instructions which, if ignored or not carefully followed, could result in minor or moderate injury.

NOTICE
This symbol and the accompanying text alerts the reader to a situation which may cause damage or malfunction to the device, either hardware or software, or surrounding property.

Reference to source of information
This symbol refers to detailed sources of information on the current topic.

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

– The device is designed for use in maritime areas.
– The device is state-of-the art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
– The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

NOTICE: Radio Interference
This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

1.4 Target Group

All configuration, programming, installation, commissioning, operating and maintenance work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers, etc.).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

The operating personnel must have been trained in handling the controller and be familiar with the operating instructions.

The installation, commissioning and maintenance personnel must have an education which entitles them to work on automation systems.

2 Installation and Commissioning

2.1 Unpacking the Device

Unpack all parts carefully and check the contents for any visible damage in transit. Also check whether the shipment matches the specifications on your delivery note.

If you notice damages in transit or discrepancies, please contact our sales department immediately.

2.2 Mounting the Device

NOTICE: Damage
When installing the device, leave a gap of at least 30 mm (1.181") around the device to ensure sufficient air circulation.

NOTICE: Damage
When the operating device is installed horizontally, please note that additional sources of heat beneath the operating device may result in heat accumulation. Make sure to allow sufficient heat dissipation!
Comply with the allowable temperature range listed in the technical data for the use of the operating device!

NOTICE: Damage
To ensure the specified degree of protection, make sure that the seal rests flat on the mounting surface and the threaded pins of the mounting brackets are uniformly tightened.

The device can be easily and quickly mounted from the rear of the device. Ideally, the device should be installed in switch panels with a plate thickness of approx. 1 mm to 6 mm (0.039" to 0.236").

1. Insert the device in the mounting cutout from the front.

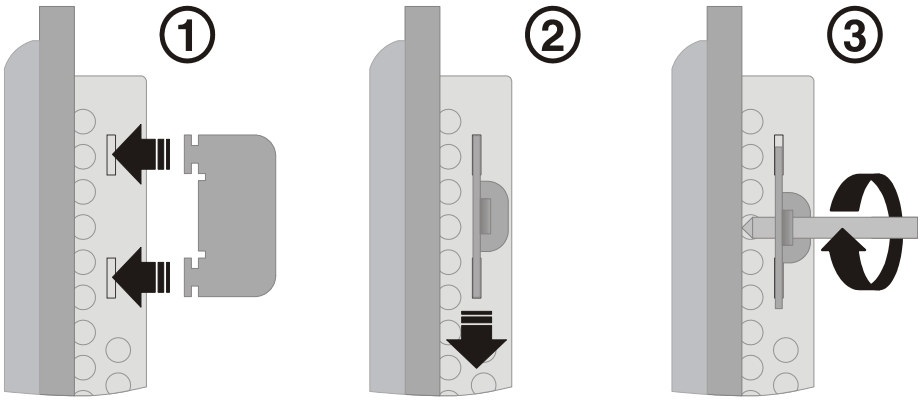


Figure 2-1 Mounting the device using a mounting bracket

2. Insert the mounting brackets into the appropriate openings (figure 1) and pull the brackets downwards until they lock in place (figure 2).
3. Fasten the device into position using the threaded pins (figure 3).

2.2.1 Front Panel Dimensions

2.2.1.1 TPM11AM, TPM11AT

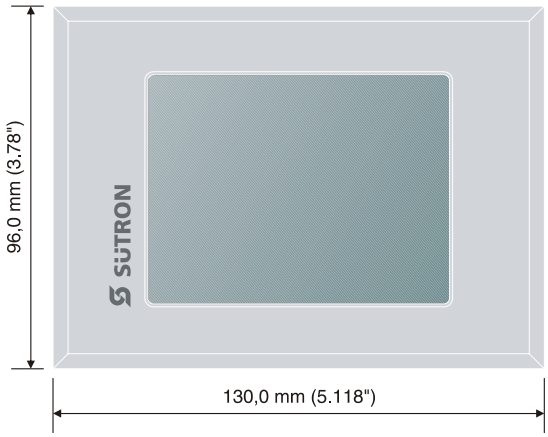


Figure 2-2 TPM11AM, TPM11AT

2.2.1.2 TPM21AM, TPM21AS, TPM21AT

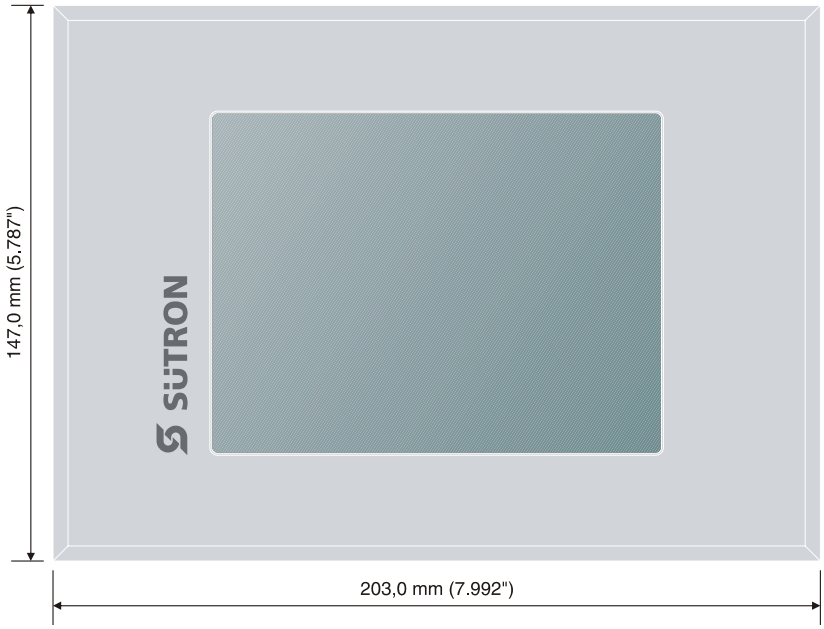


Figure 2-3 TPM21AM, TPM21AS, TPM21AT

2.2.1.3 TPM35AM, TPM35AT

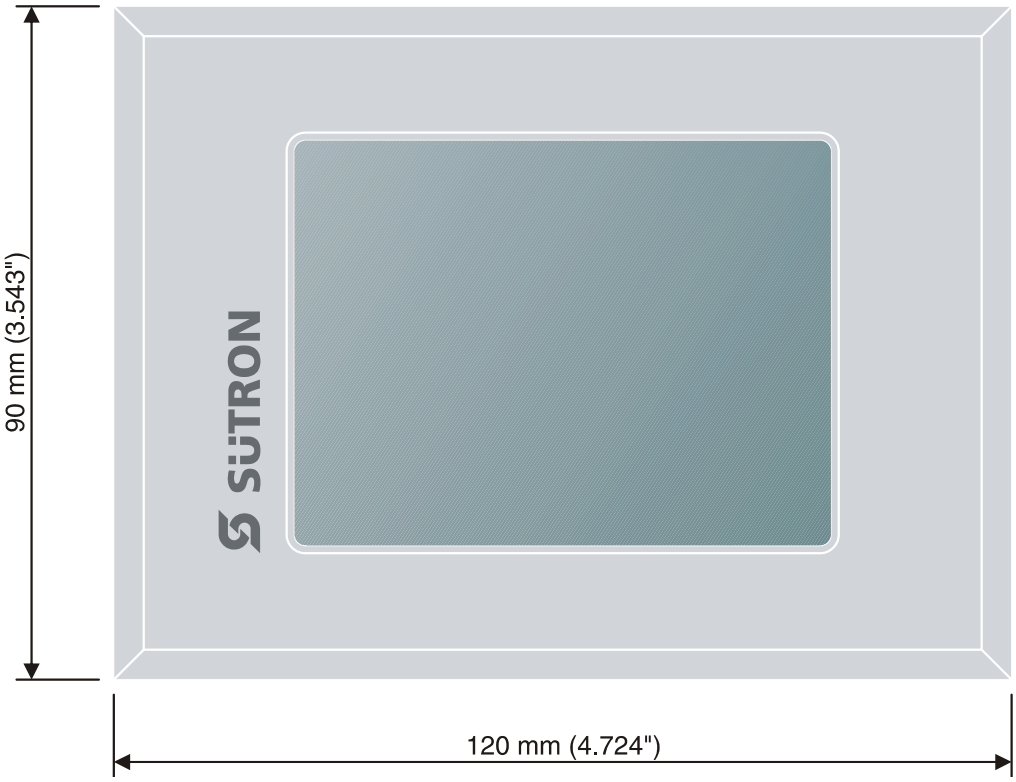


Figure 2-4 TPM35AM, TPM35AT

2.2.1.4 TPM43AT

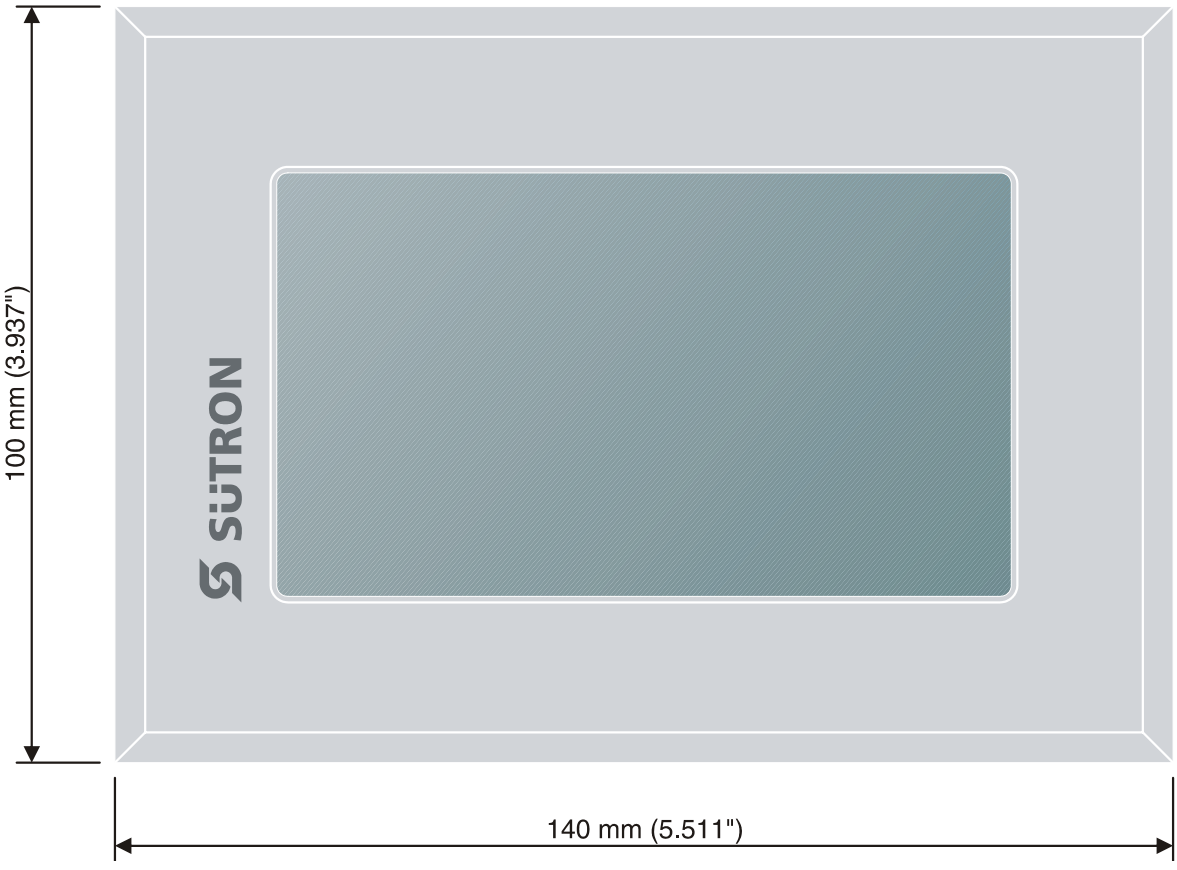


Figure 2-5 TPM43AT

2.2.1.5 TPM57AM, TPM57AT

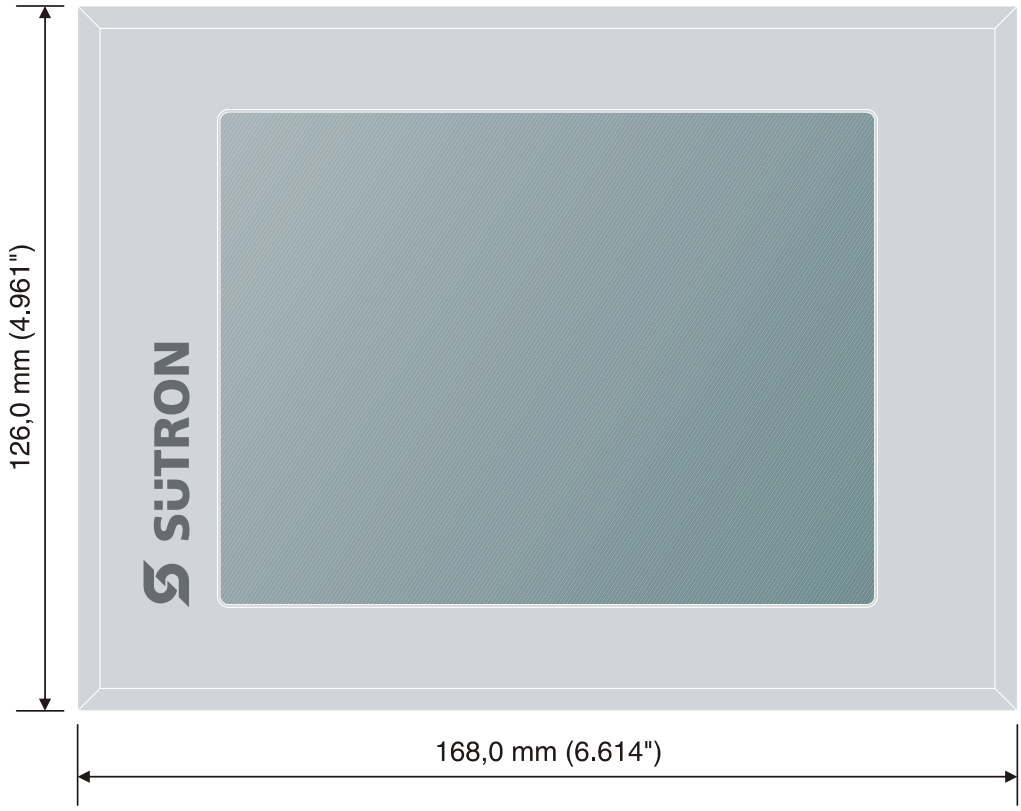


Figure 2-6 TPM57AM, TPM57AT

2.2.1.6 TPM70AT

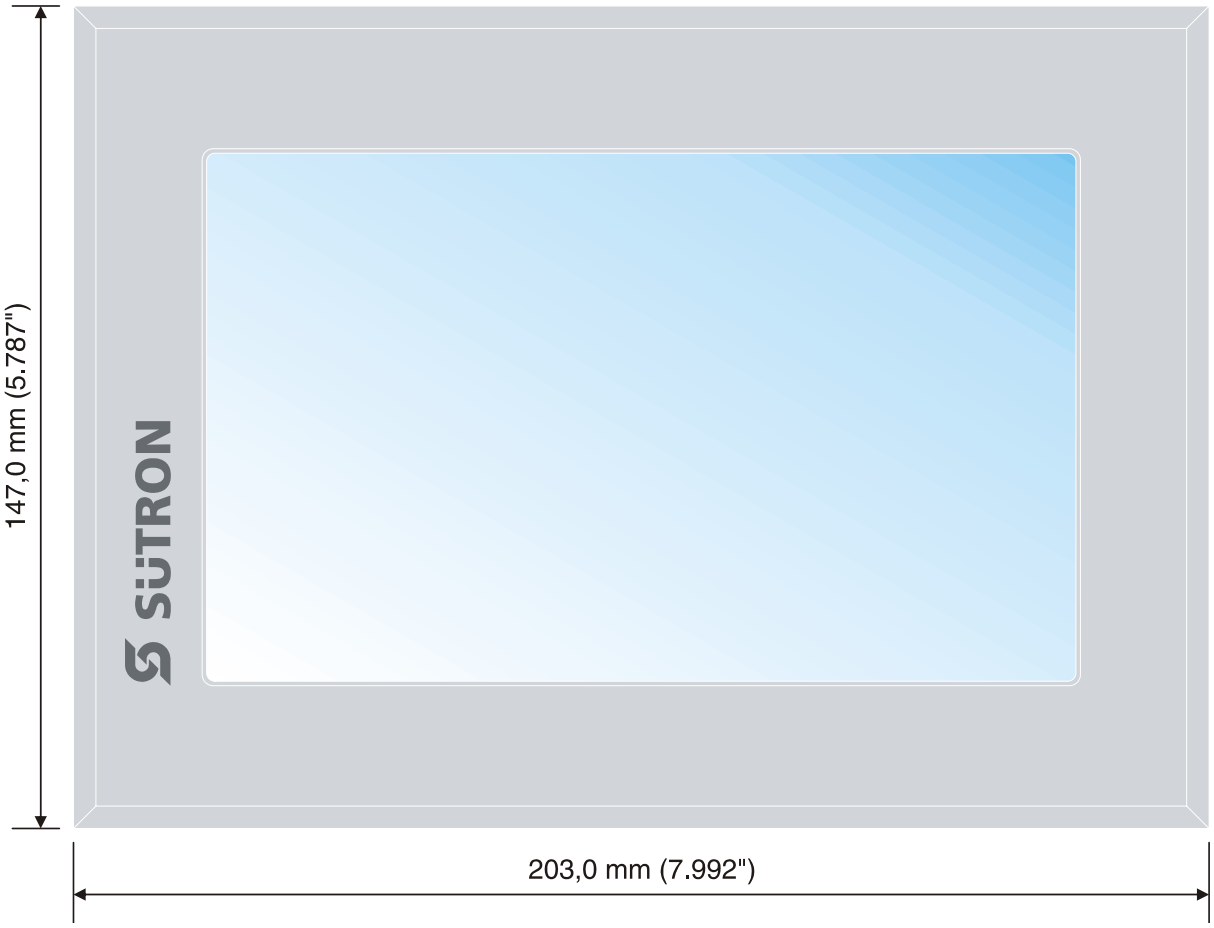


Figure 2-7 TPM70AT

2.2.1.7 TPM90AT

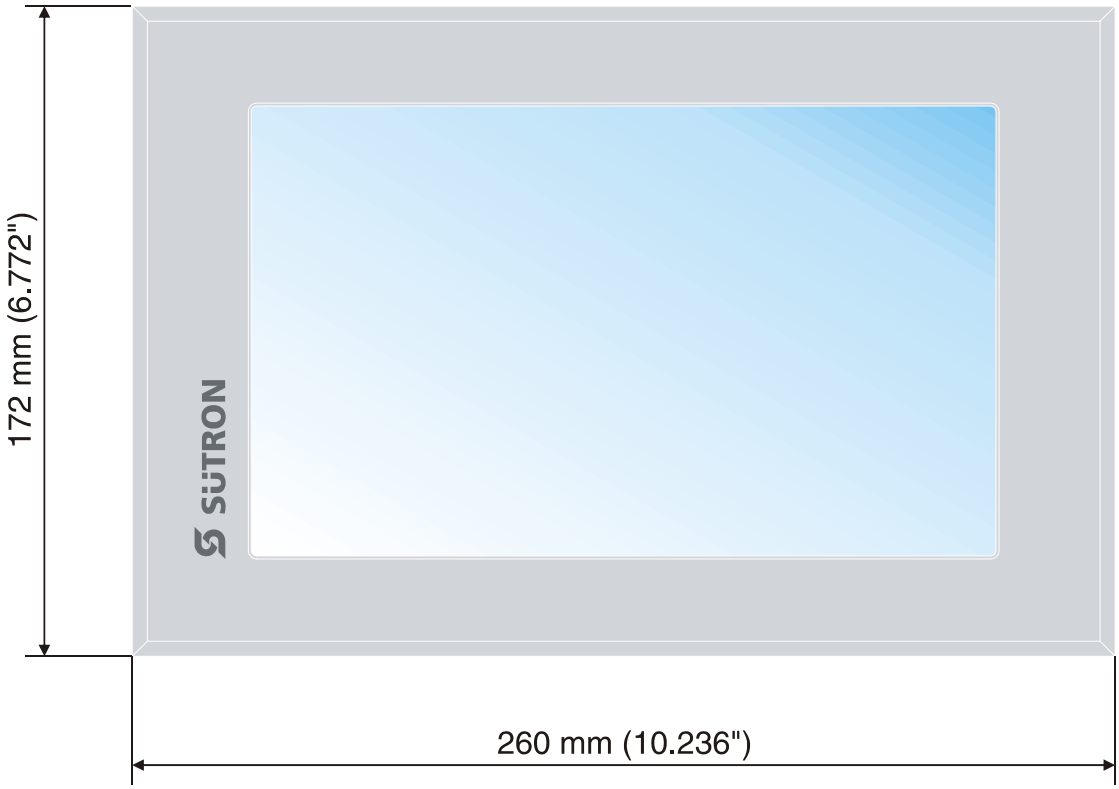


Figure 2-8 TPM90AT

2.2.1.8 TPM104AT

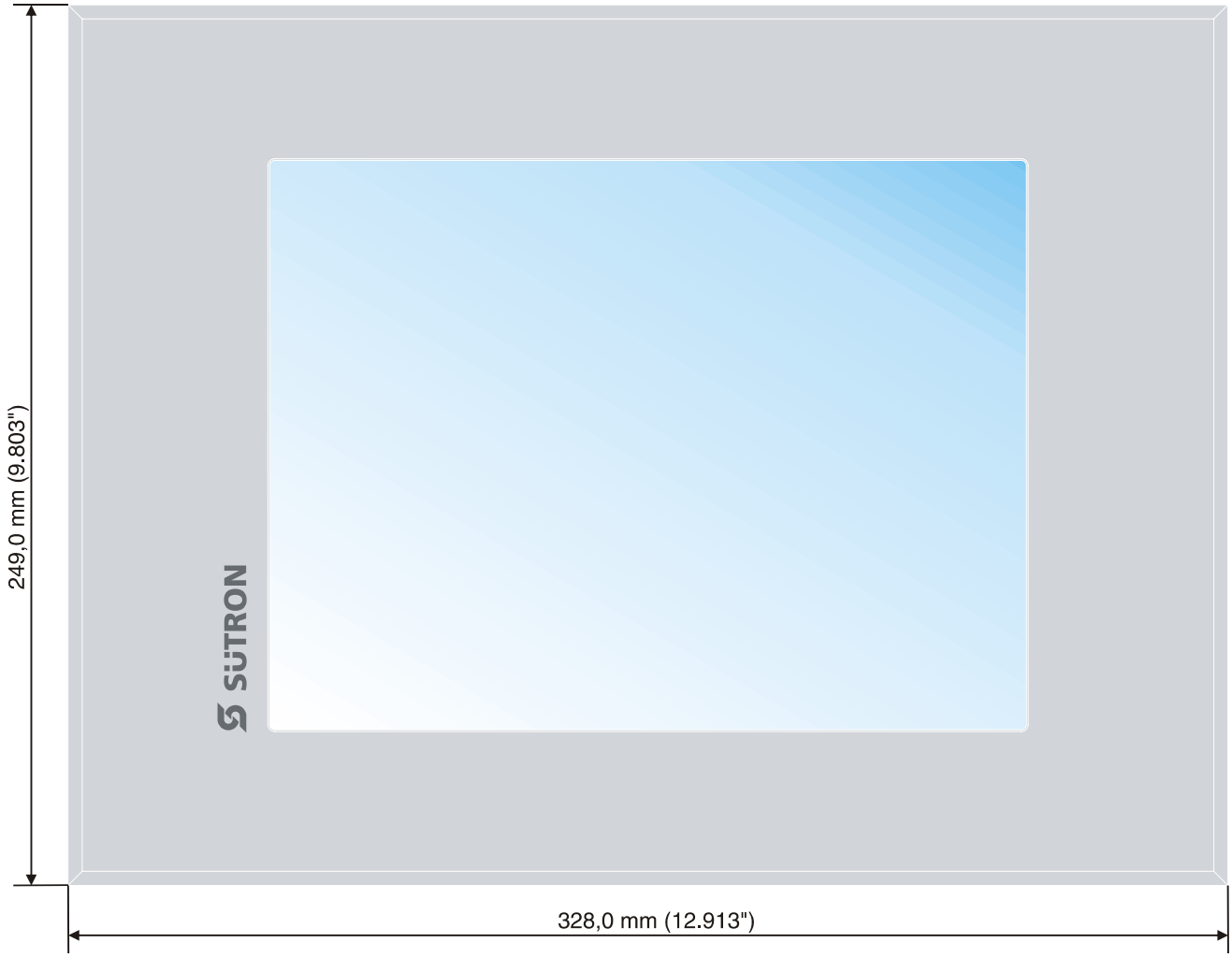


Figure 2-9 TPM104AT

2.2.1.9 TPM105AT

Figure 2-10 TPM105AT

2.2.1.10 TPM120AT

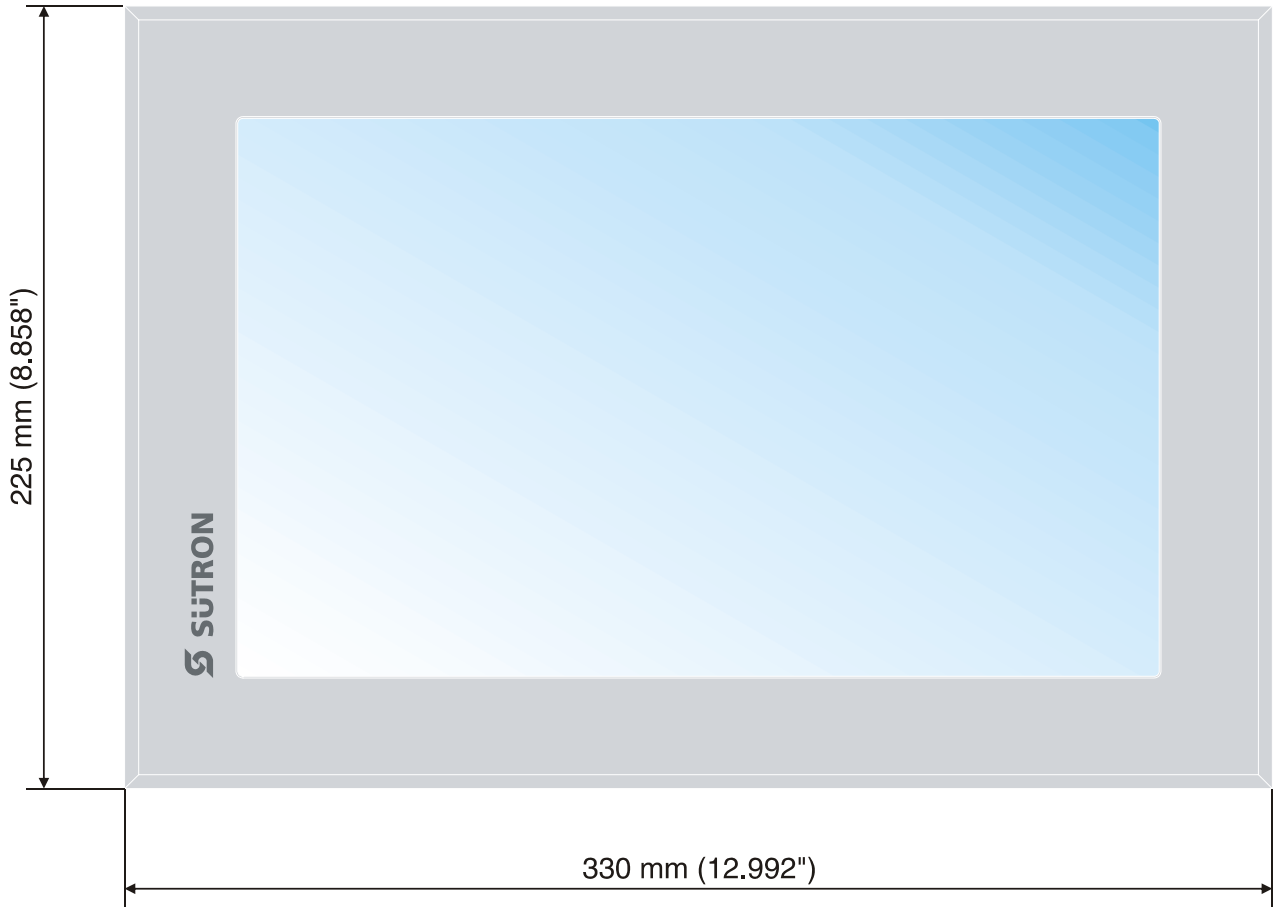


Figure 2-11 TPM120AT

2.2.1.11 TPM151AT

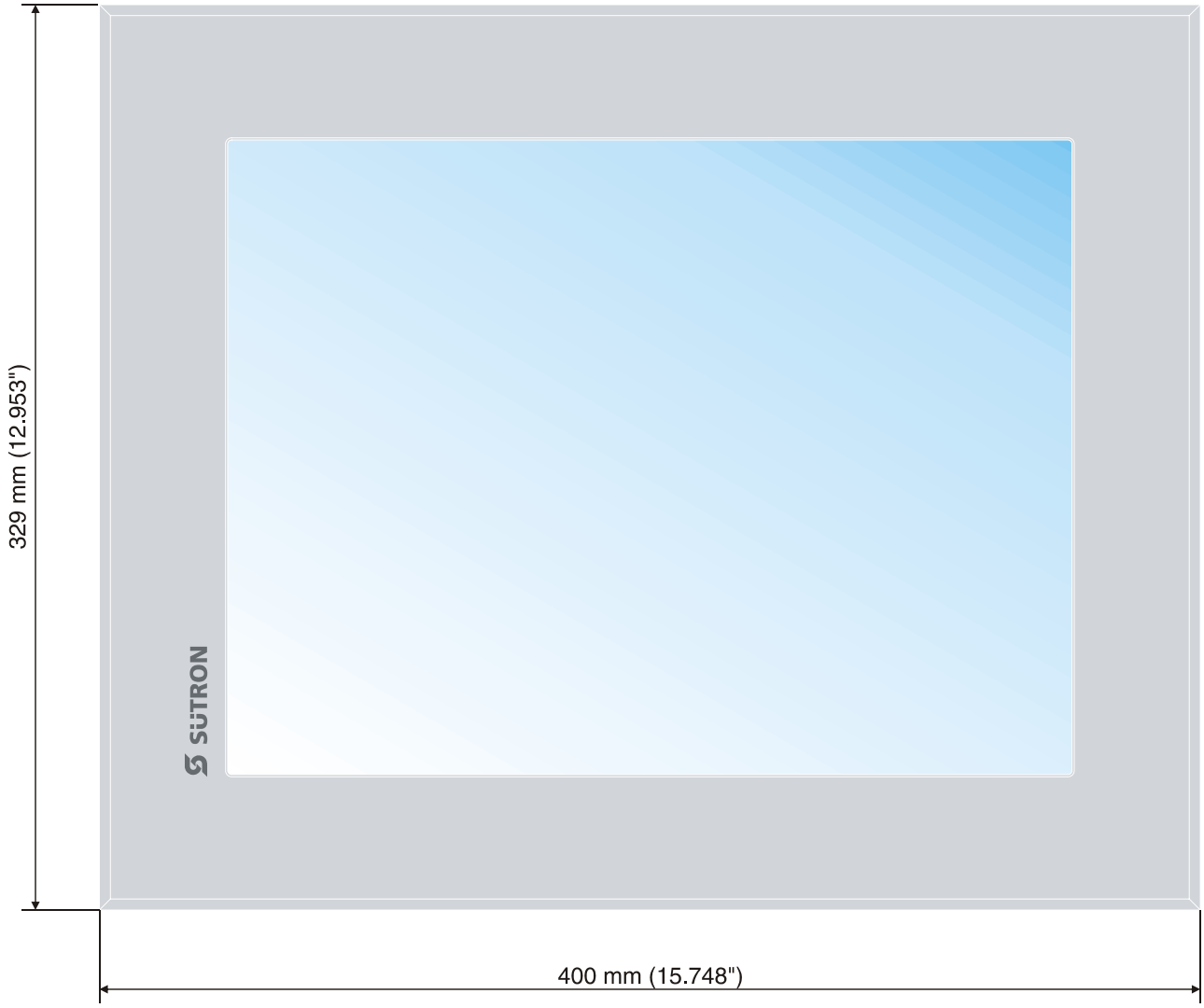


Figure 2-12 TPM151AT

2.2.2 Mounting Cutout

2.2.2.1 TPM11AM, TPM11AT

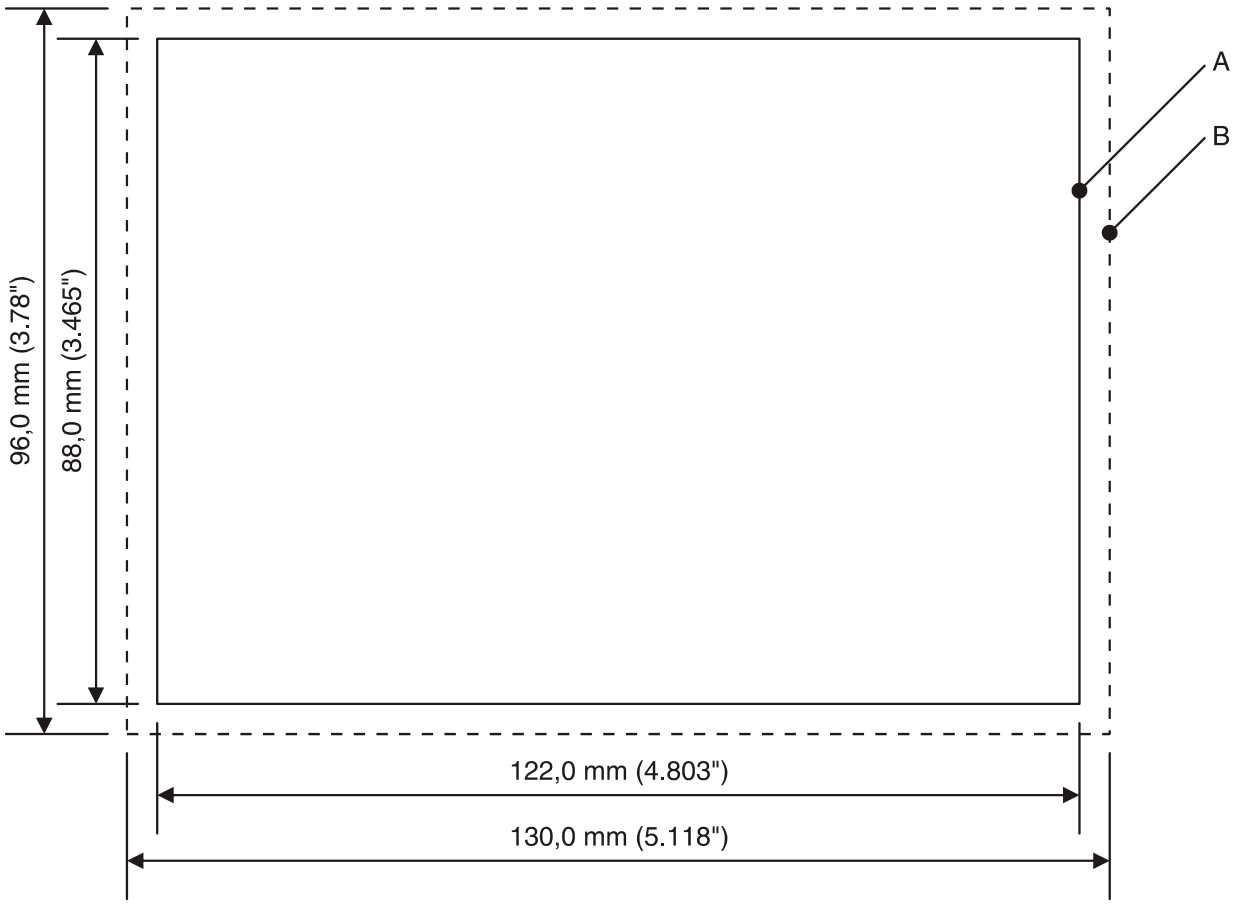


Figure 2-13 TPM11AM, TPM11AT

A Mounting Cutout
B Front Panel

2.2.2.2 TPM21AM, TPM21AS, TPM21AT

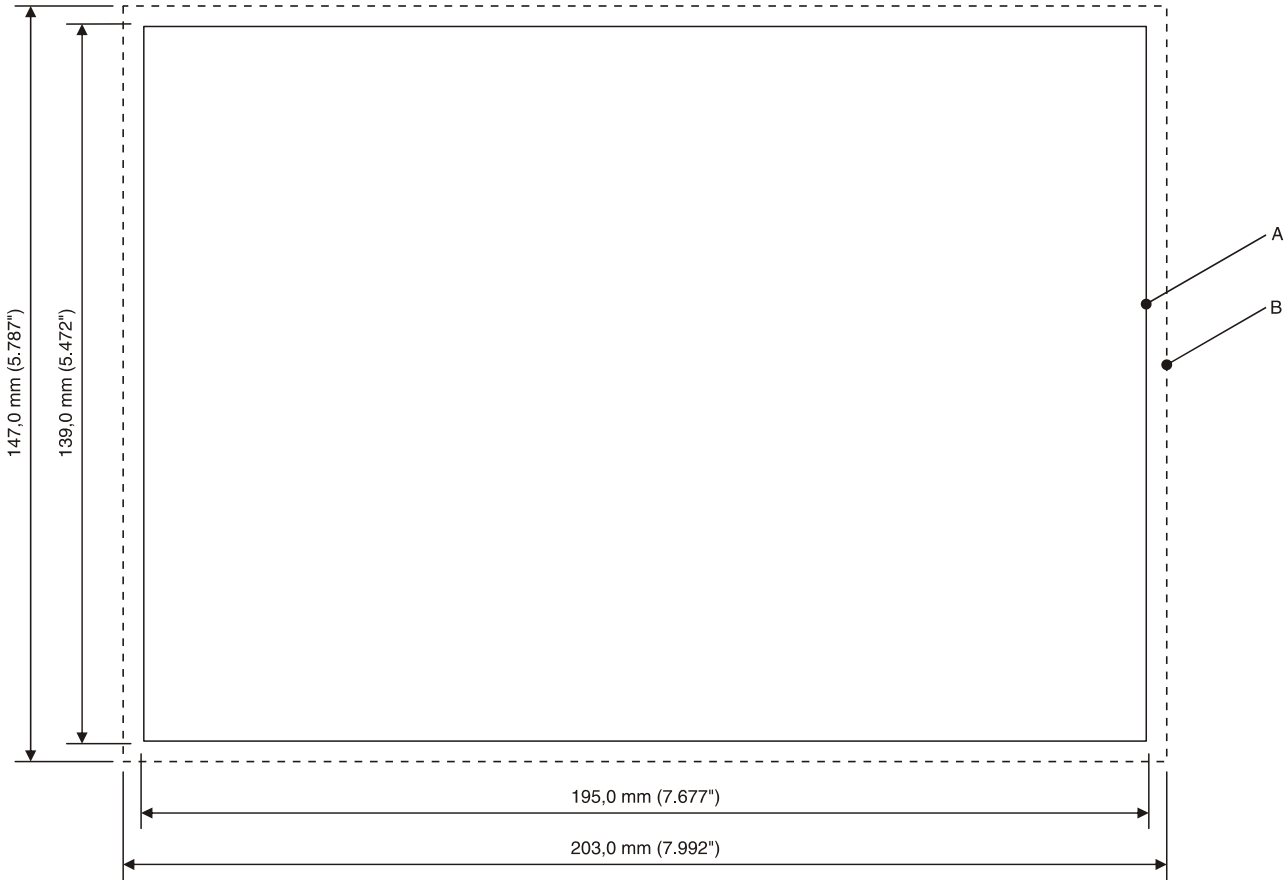


Figure 2-14 TPM21AM, TPM21AS, TPM21AT

A Mounting Cutout
B Front Panel

2.2.2.3 TPM35AM, TPM35AT

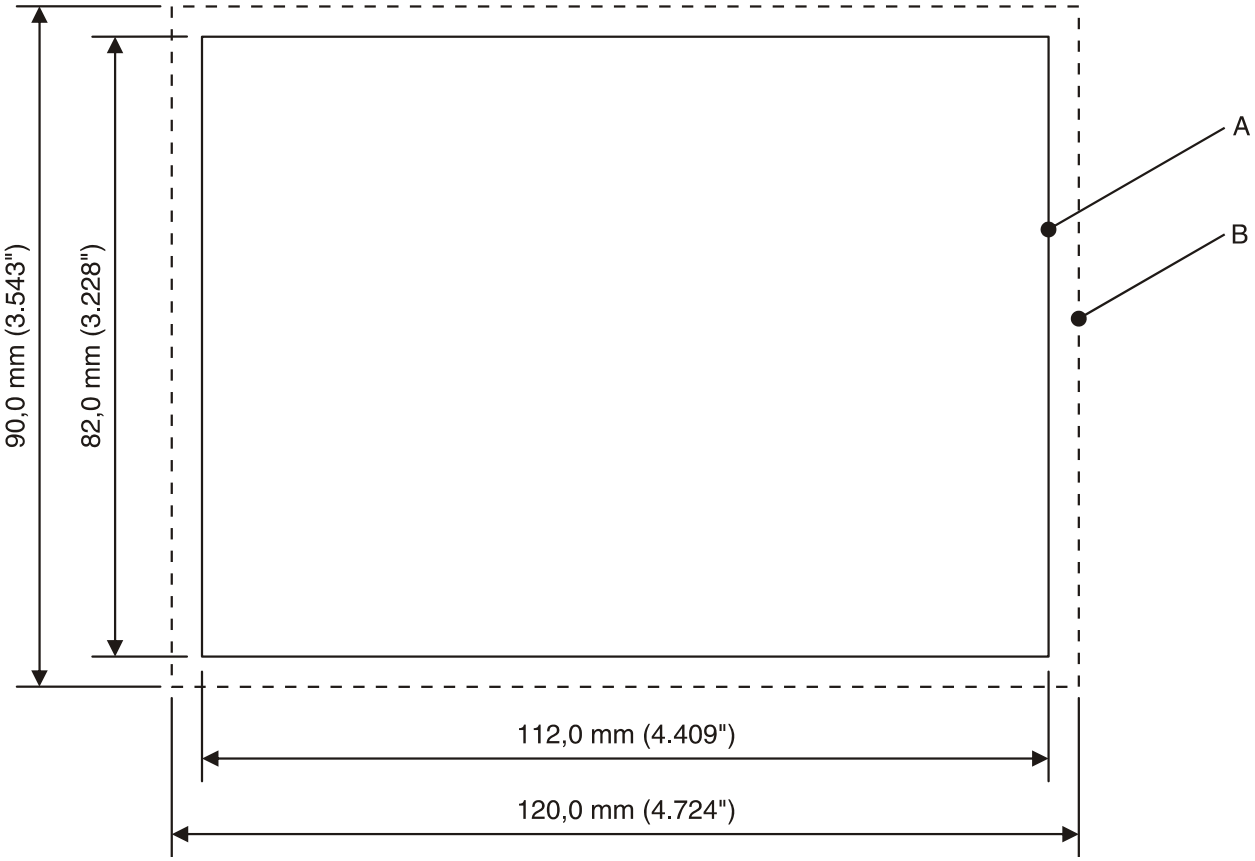


Figure 2-15 TPM35AM, TPM35AT

A Mounting Cutout
B Front Panel

2.2.2.4 TPM43AT

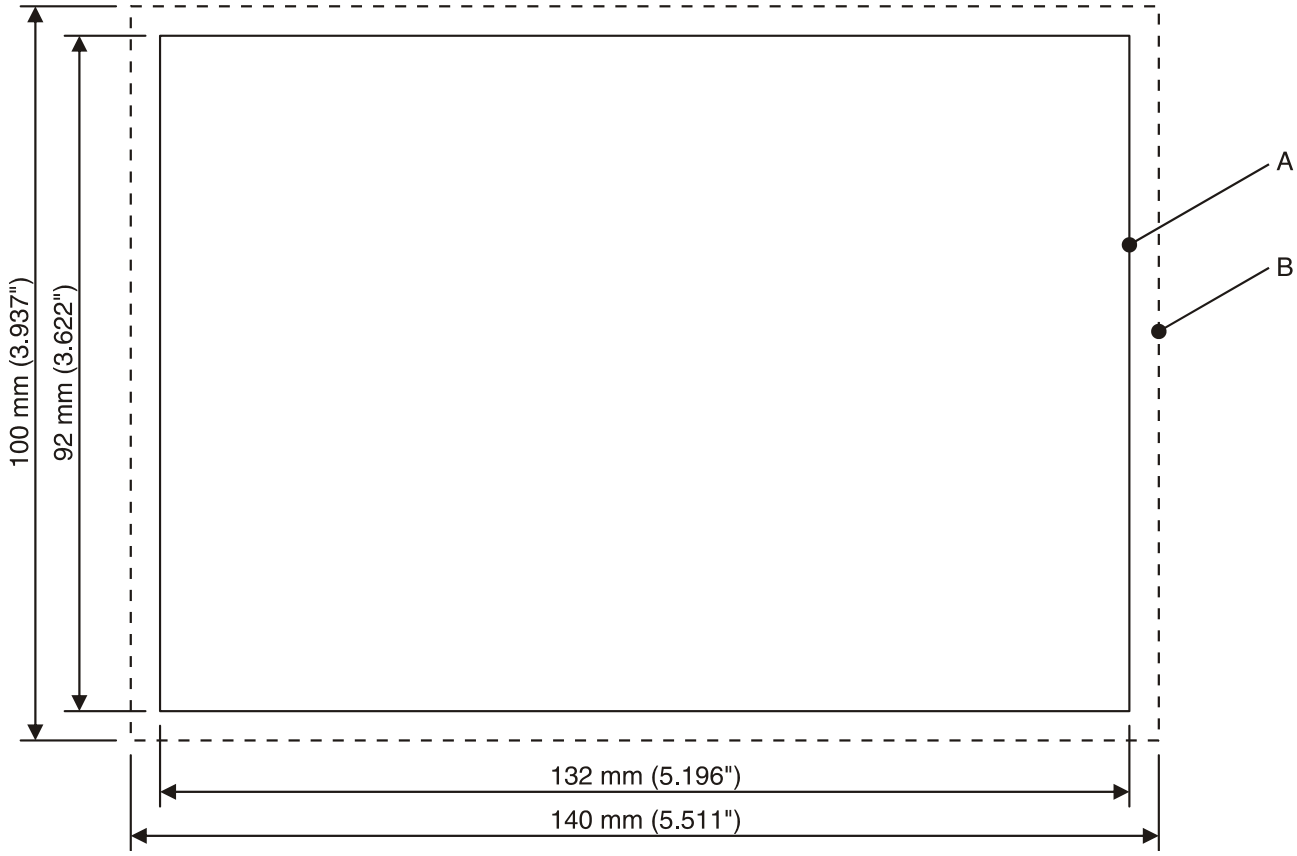


Figure 2-16 TPM43AT

A Mounting Cutout
B Front Panel

2.2.2.5 TPM57AM, TPM57AT

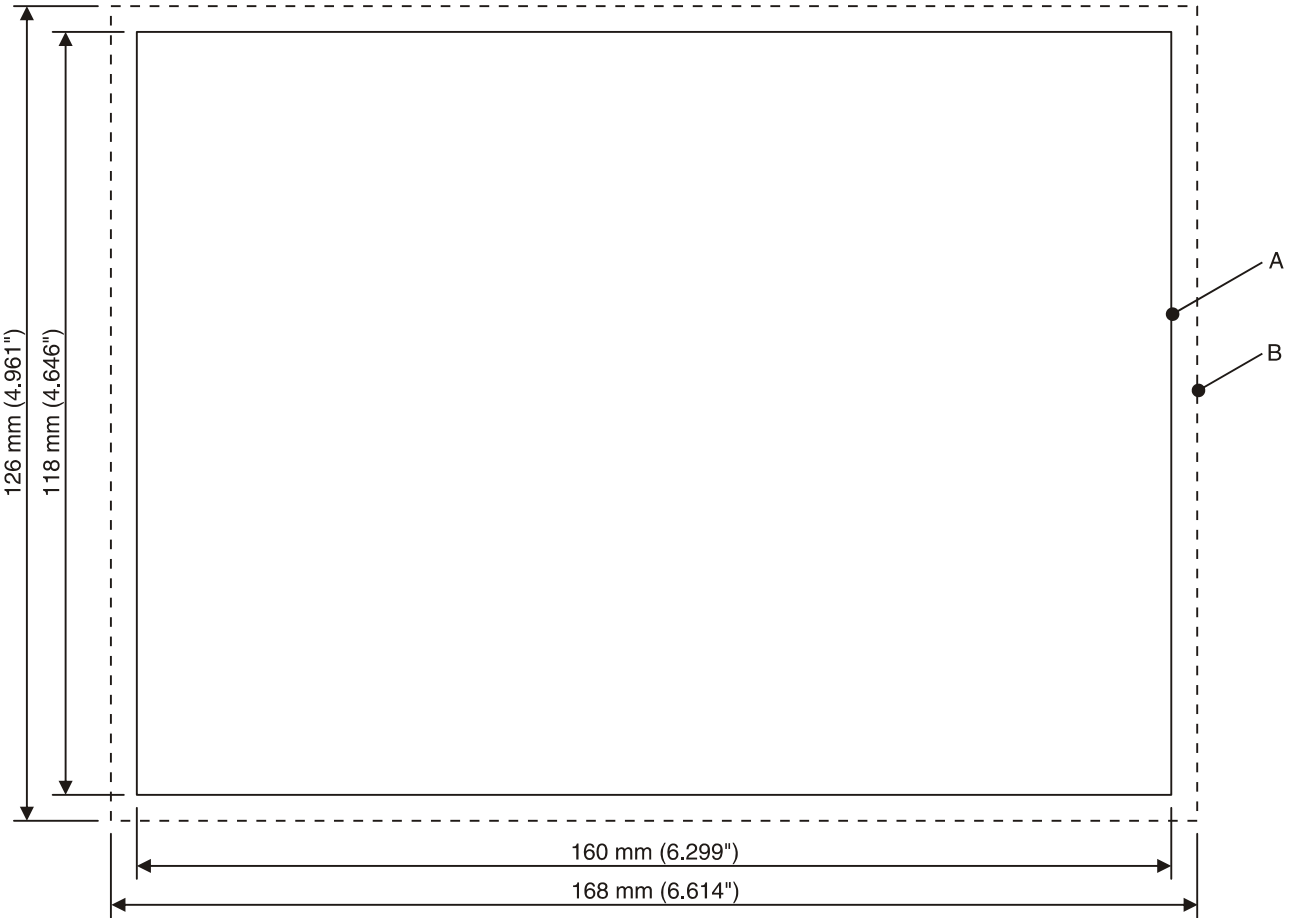


Figure 2-17 TPM57AM, TPM57AT

A Mounting Cutout
B Front Panel

2.2.2.6 TPM70AT

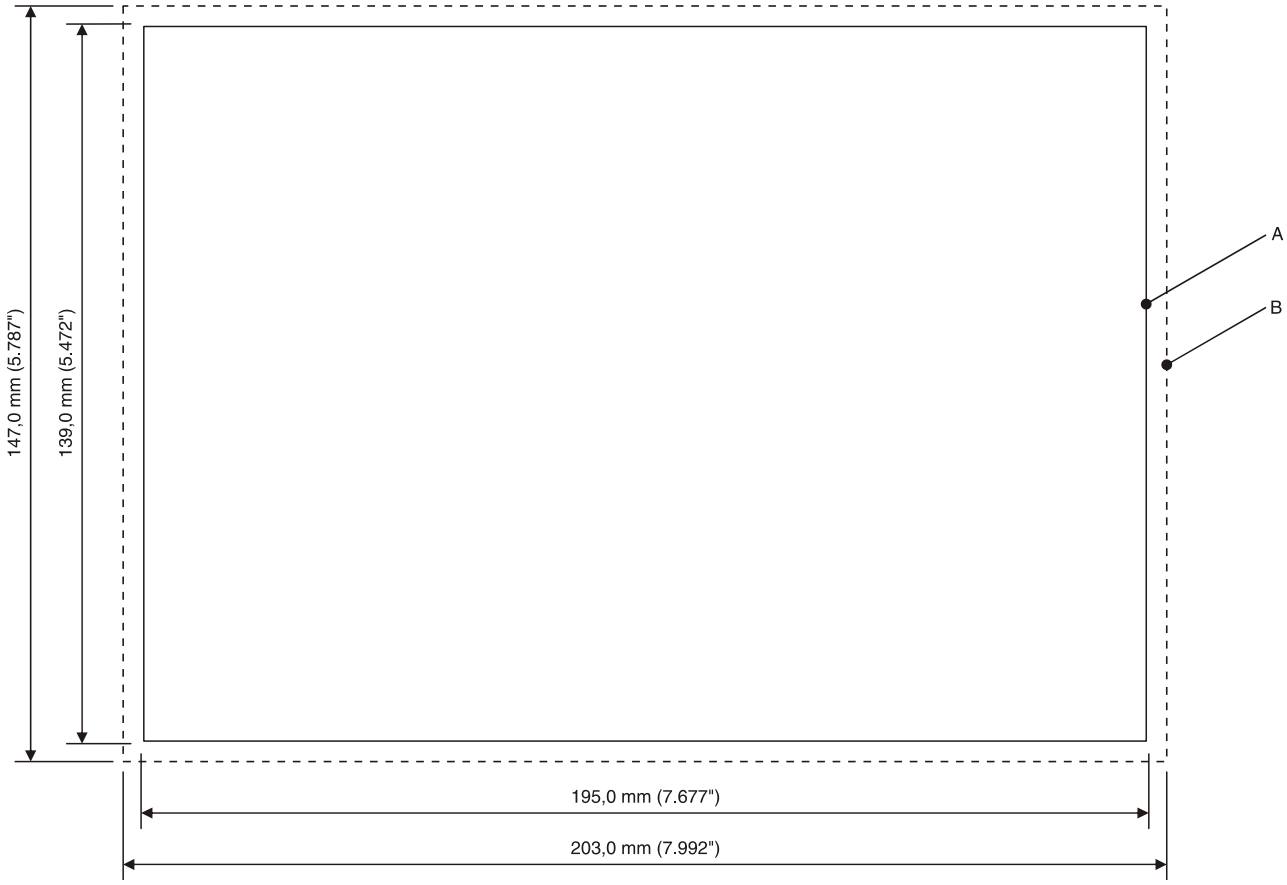


Figure 2-18 TPM70AT

A Mounting Cutout
B Front Panel

2.2.2.7 TPM90AT

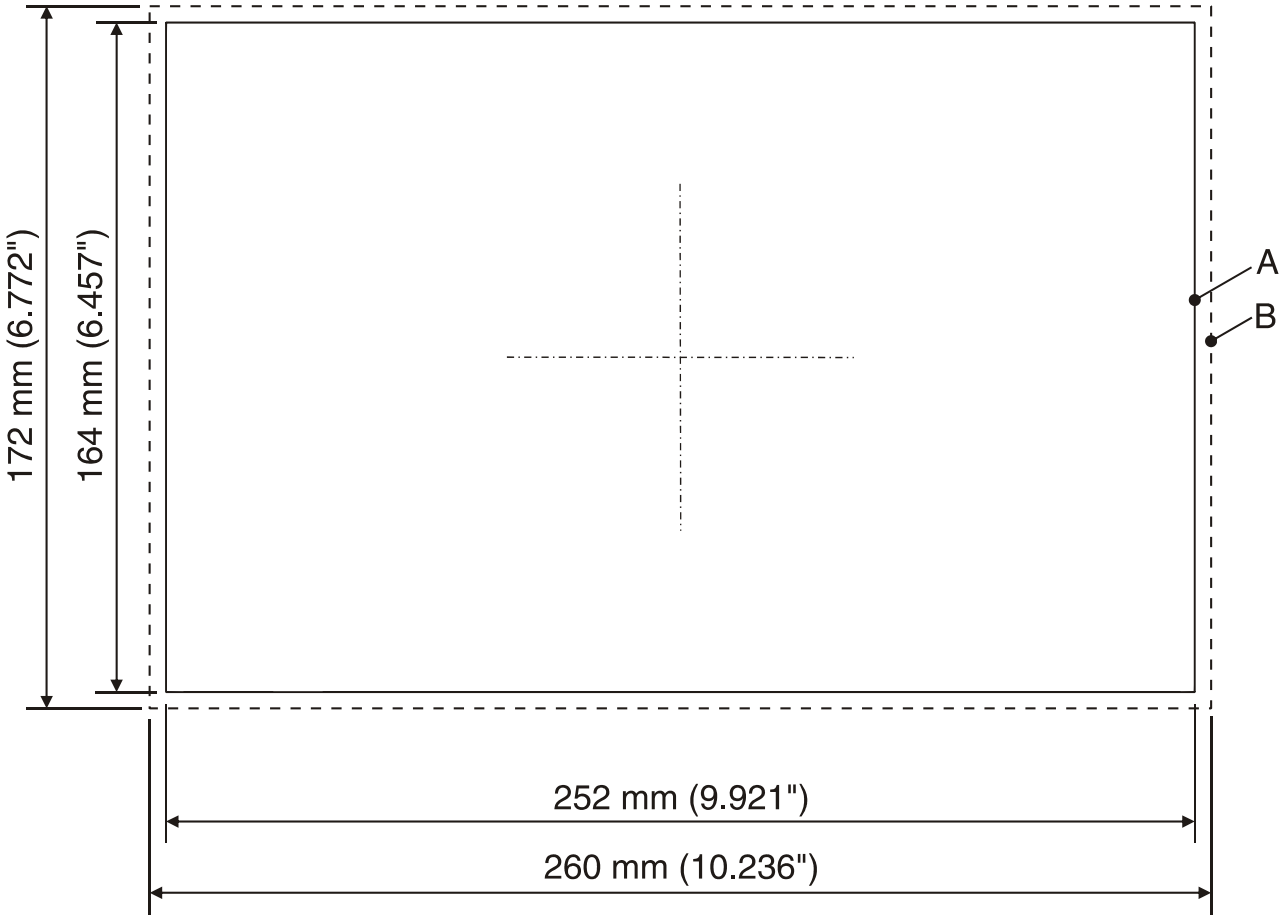


Figure 2-19 TPM90AT

A Mounting Cutout
B Front Panel

2.2.2.8 TPM104AT

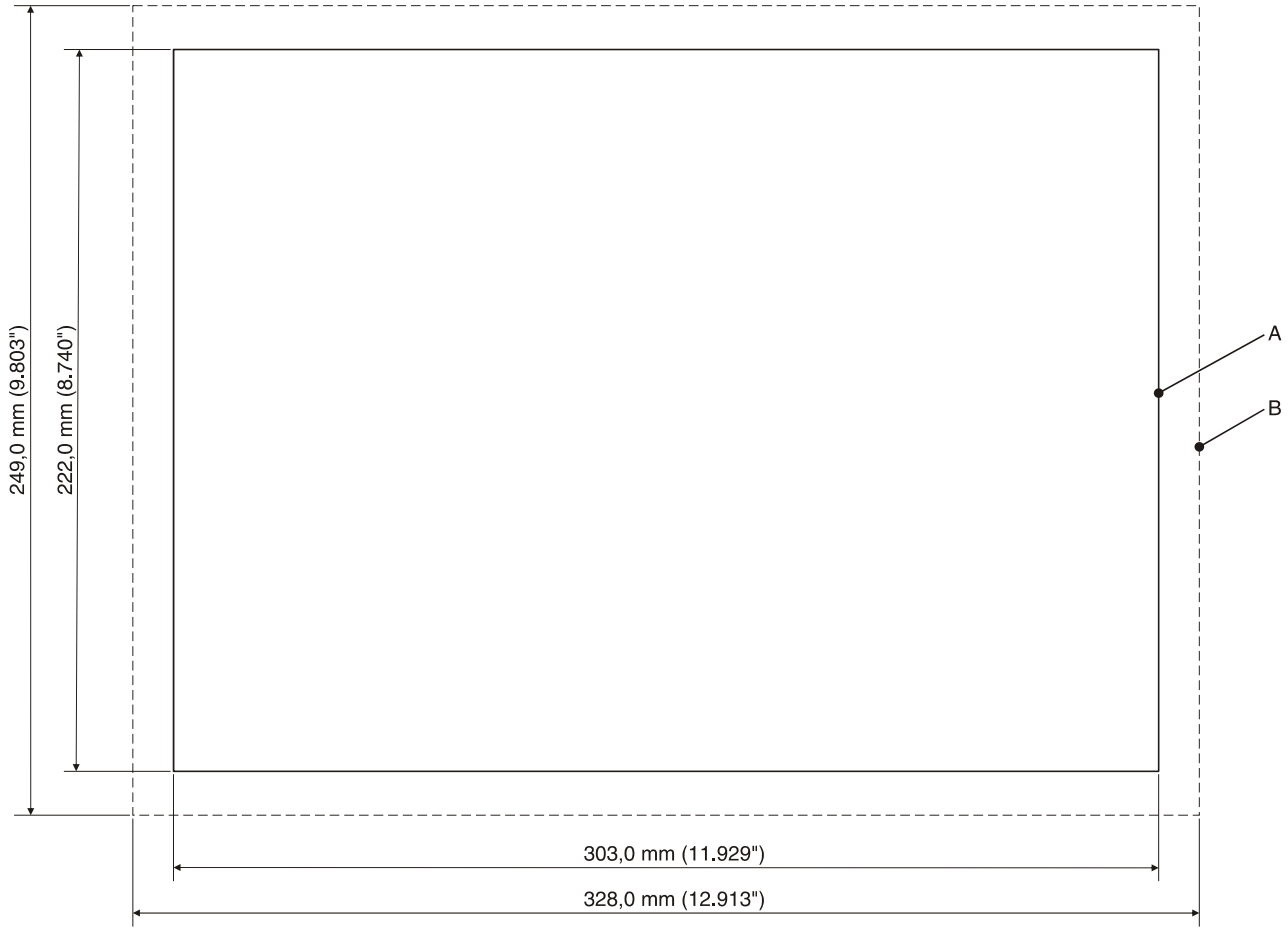


Figure 2-20 TPM104AT

A Mounting Cutout
B Front Panel

2.2.2.9 TPM105AT

Figure 2-21 TPM105AT

A Mounting Cutout
B Front Panel

2.2.2.10 TPM120AT

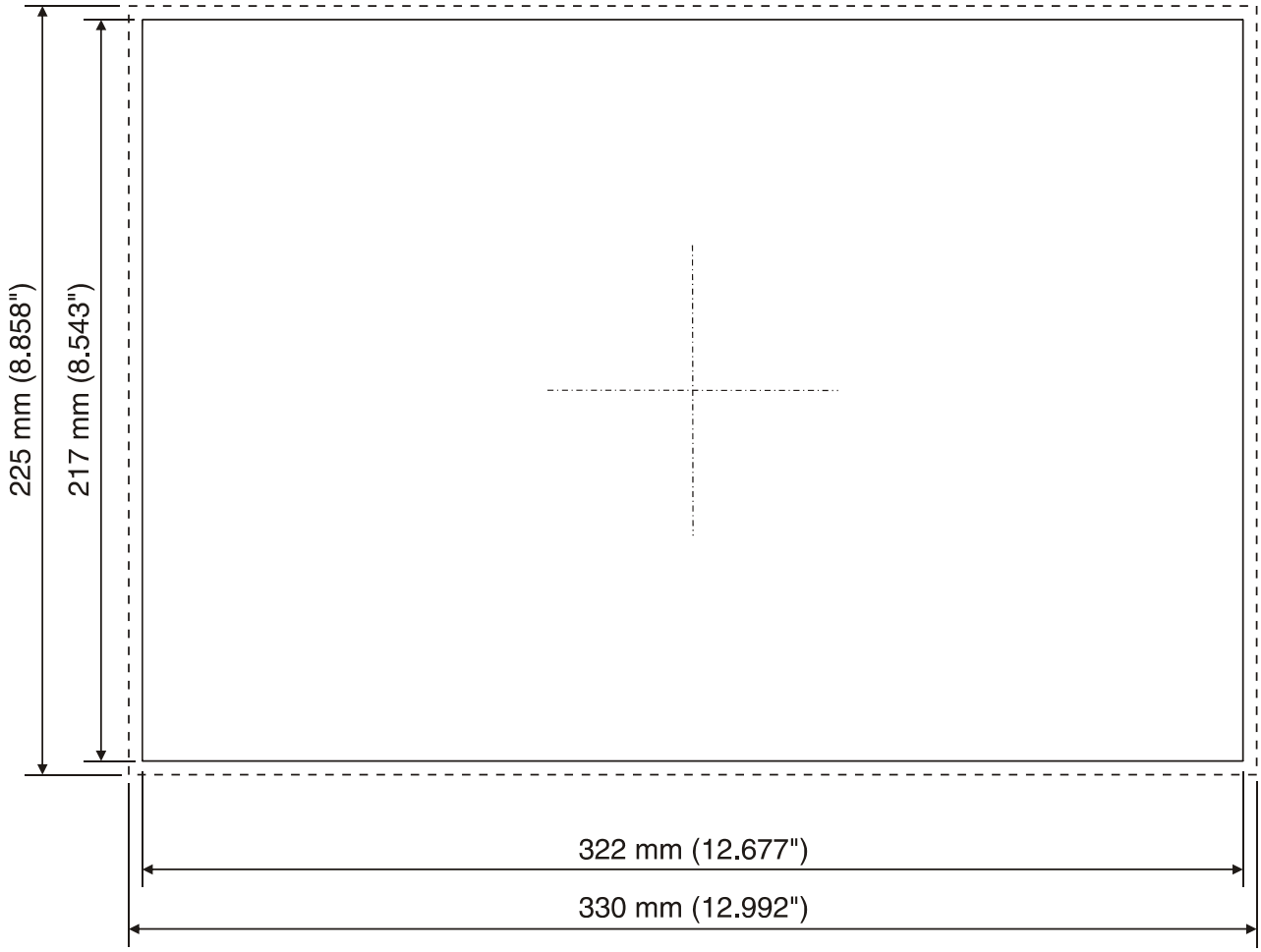


Figure 2-22 TPM120AT

A Mounting Cutout
B Front Panel

2.2.2.11 TPM151AT

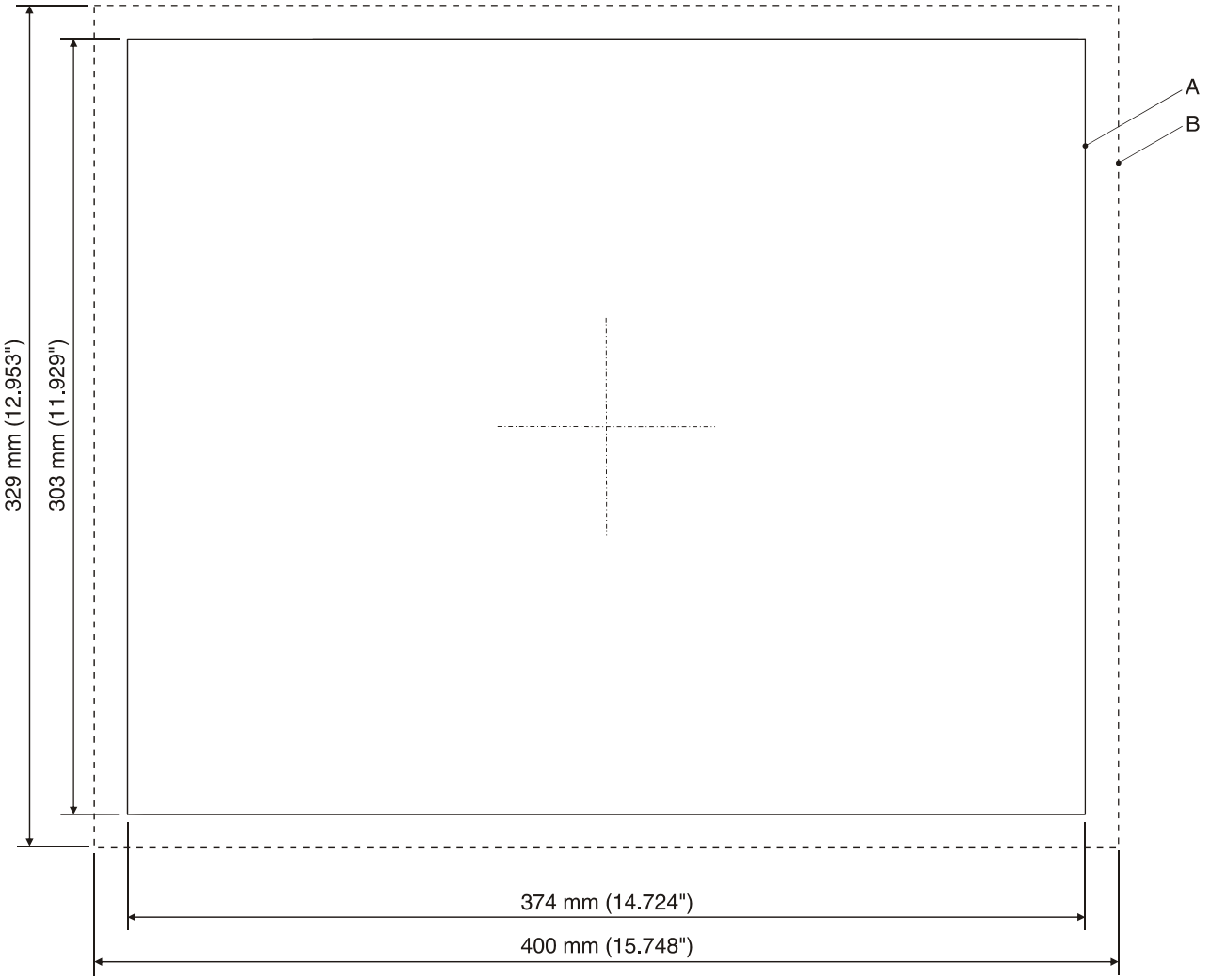


Figure 2-23 TPM151AT

A Mounting Cutout
B Front Panel

2.2.3 Side View, Mounting Depth

2.2.3.1 TPM11AM, TPM11AT

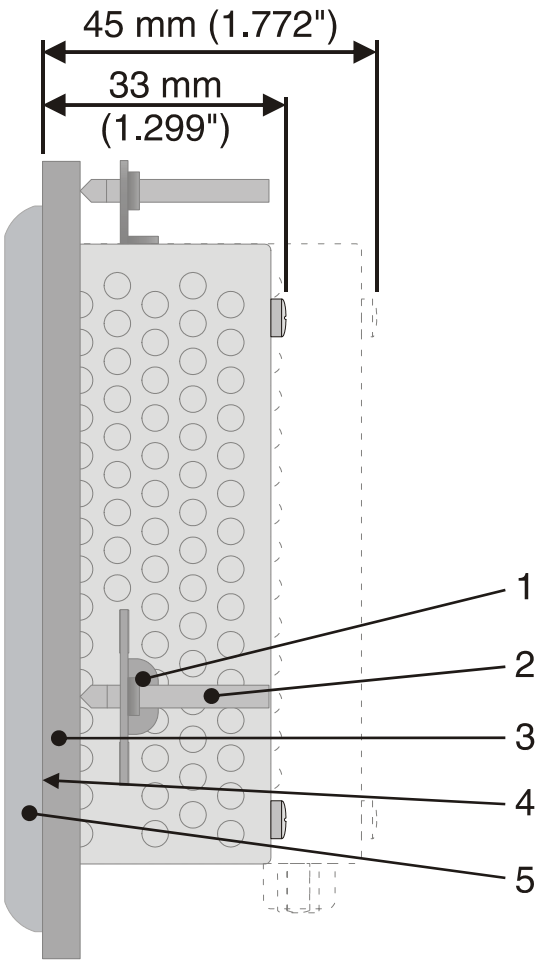


Figure 2-24 TPM11AM, TPM11AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.2 TPM21AM, TPM21AS, TPM21AT

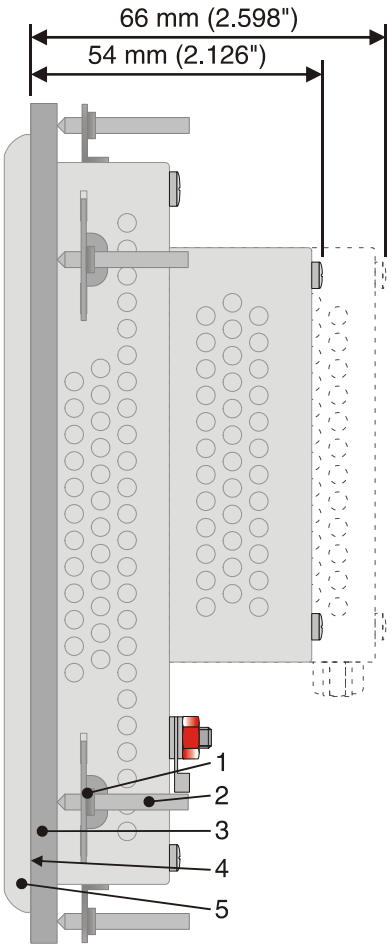


Figure 2-25 TPM21AM, TPM21AS, TPM21AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.3 TPM35AM, TPM35AT

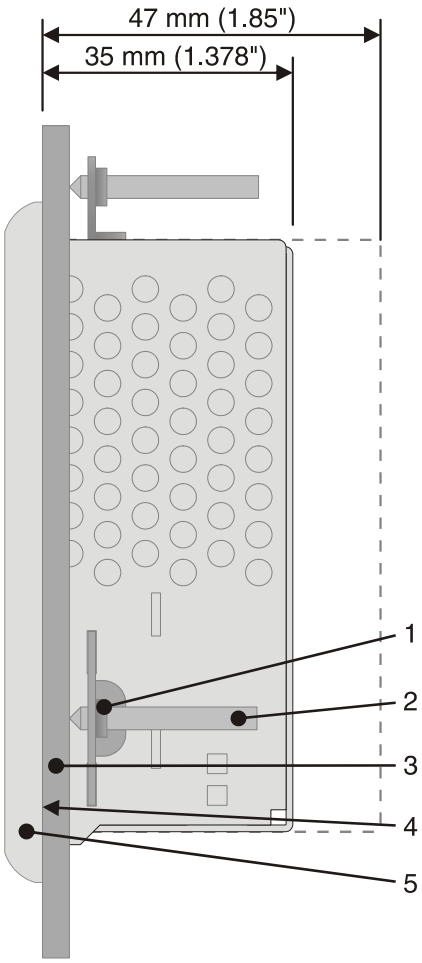


Figure 2-26 TPM35AM, TPM35AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.4 TPM43AT

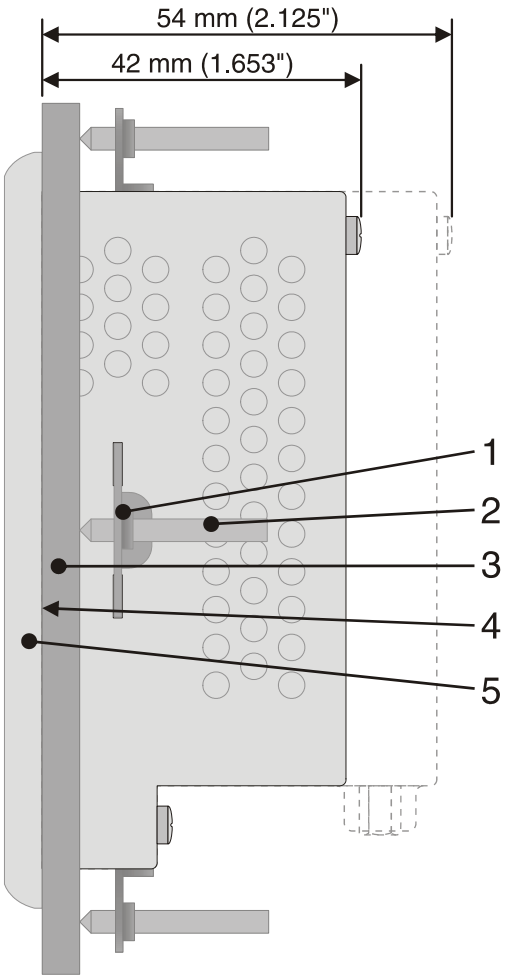


Figure 2-27 TPM43AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.5 TPM57AM, TPM57AT

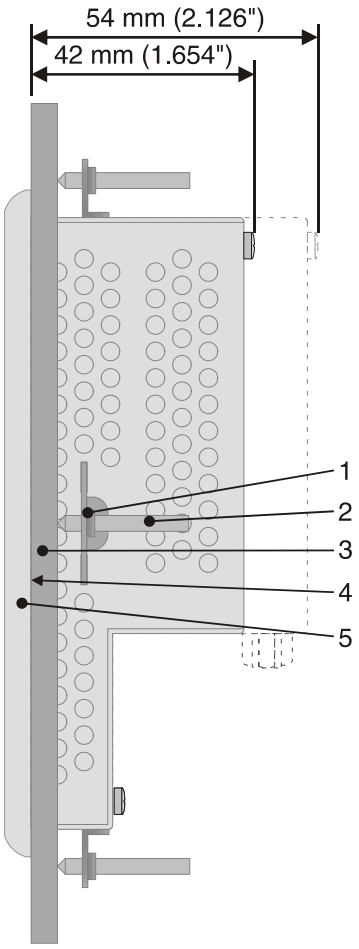


Figure 2-28 TPM57AM, TPM57AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.6 TPM70AT

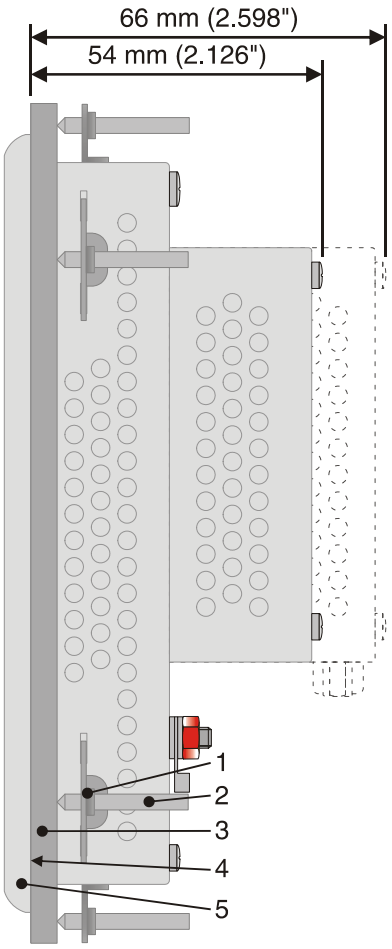


Figure 2-29 TPM70AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.7 TPM90AT

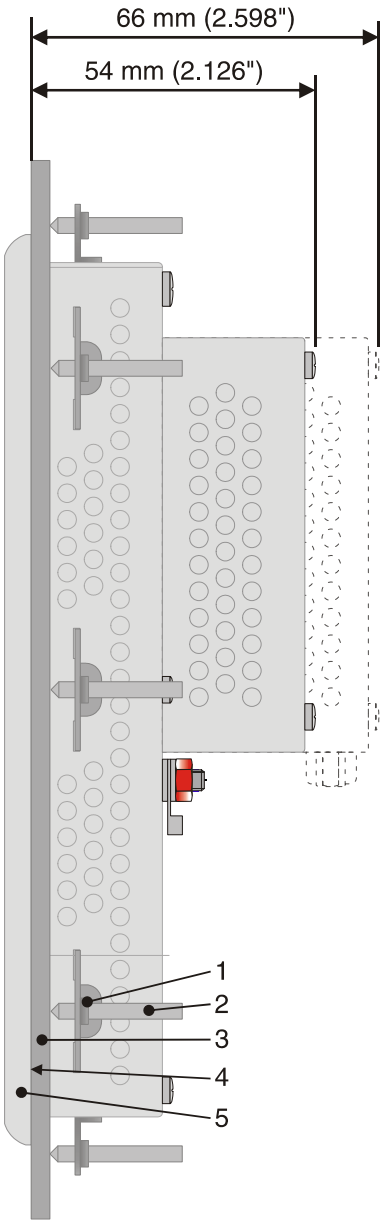


Figure 2-30 TPM90AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.8 TPM104AT

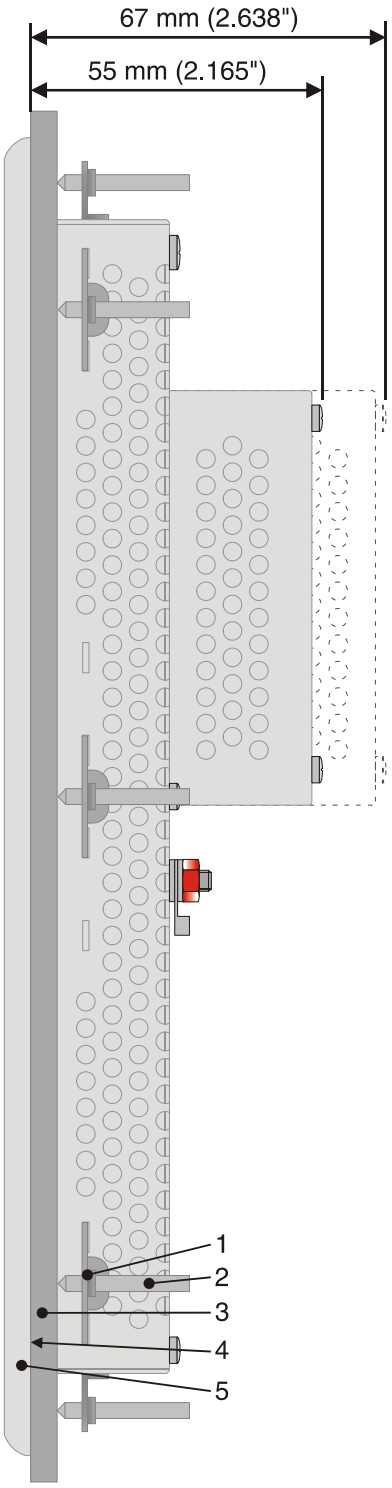


Figure 2-31 TPM104AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.9 TPM105AT

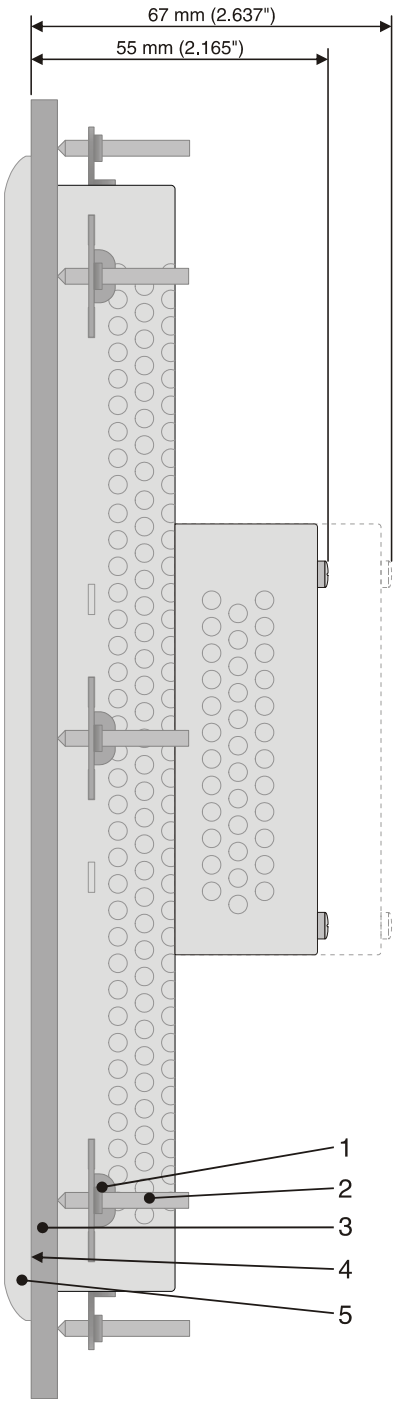


Figure 2-32 TPM105AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.10 TPM120AT

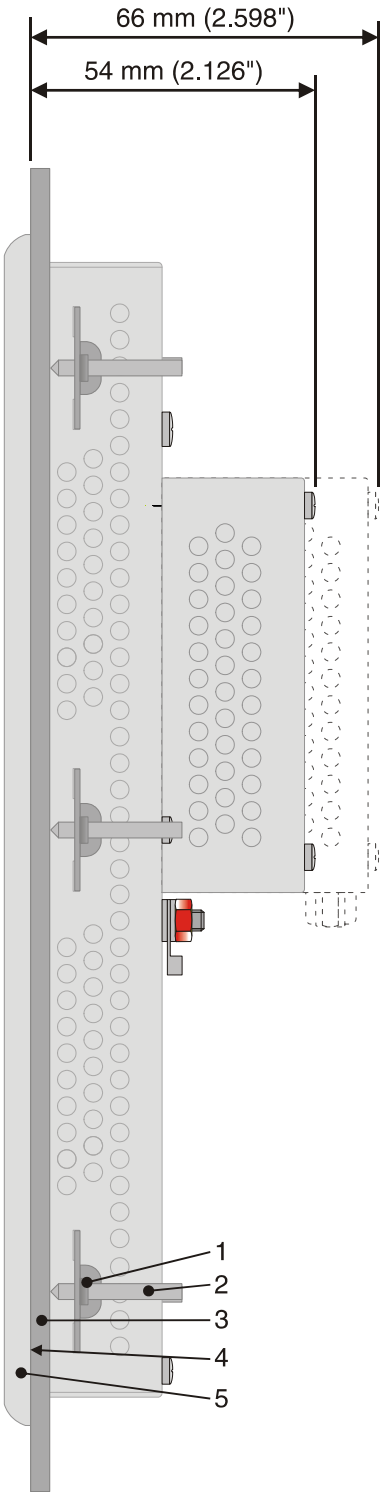


Figure 2-33 TPM120AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.11 TPM151AT

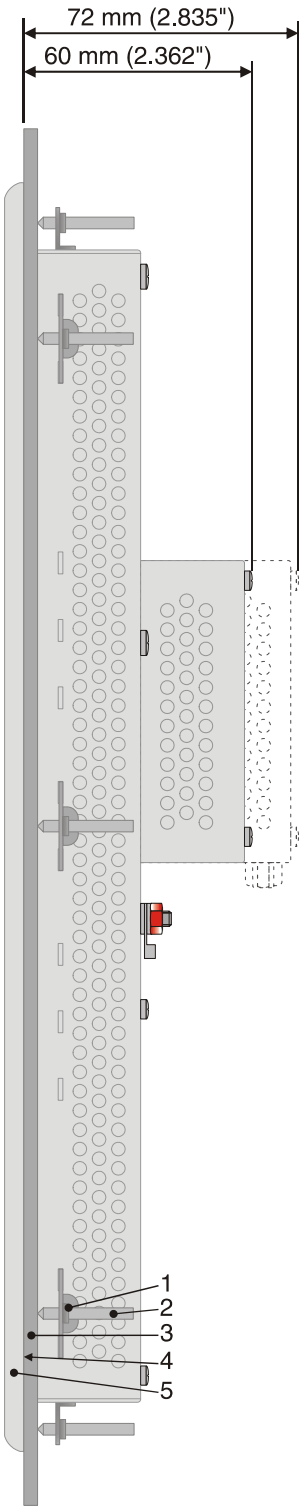


Figure 2-34 TPM151AT

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.3 Connecting the Device

2.3.1 Supply Voltage

The supply voltage is supplied via connector X1.

Refer to the technical data for the permissible supply voltage of the operating device.

The device has reverse polarity protection. In case of wrong polarity, the device will not operate.

This is a protection class I device. For safe operation, safety extra-low voltage (SELV) in accordance with DIN EN 61131 must be used for the supply voltage.

Connector in the operating device: 3 pin connector

A suitable female connector strip is supplied.

Table 2-1 Pin assignment supply voltage

Pin	Designation	Function
1	⏚	Low-Noise Ground
2	0 V	Supply Voltage 0 V
3	24 VDC	Supply Voltage 24 VDC

NOTICE: Damage
Cables with finely stranded conductors with a minimum cross-section of 0.75 mm² (18 AWG) and a maximum cross-section of 2.5 mm² (14 AWG) must be used for the supply voltage.

DANGER: Hazardous voltages
Hazardous voltages can exist inside electrical installations that can pose a danger to humans. Coming in contact with live parts may result in electric shock!

Use the following procedure to connect the device to the supply voltage:

1. Strip approx. 30 mm (1.181") off the outer cable sheath and approx. 5 mm (0.197") off the wires.

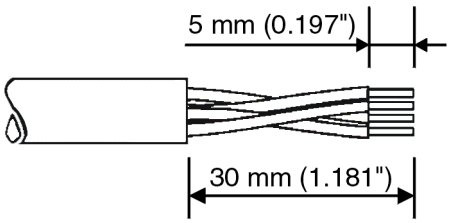


Figure 2-35 Preparing the cable

2. Fit the wires with wire end ferrules and connect the wires to the connector.

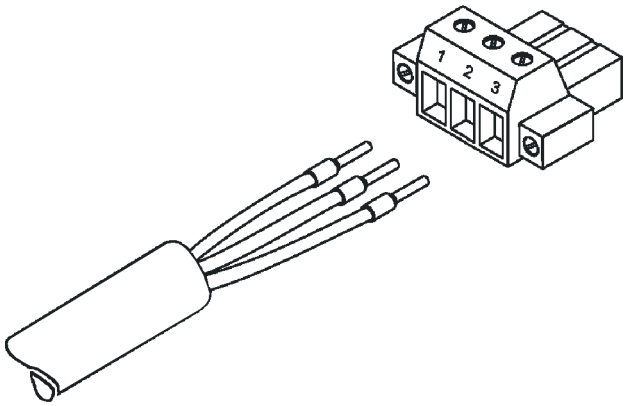


Figure 2-36 Connecting the female connector strip

3. Plug the female connector strip onto connector X1.

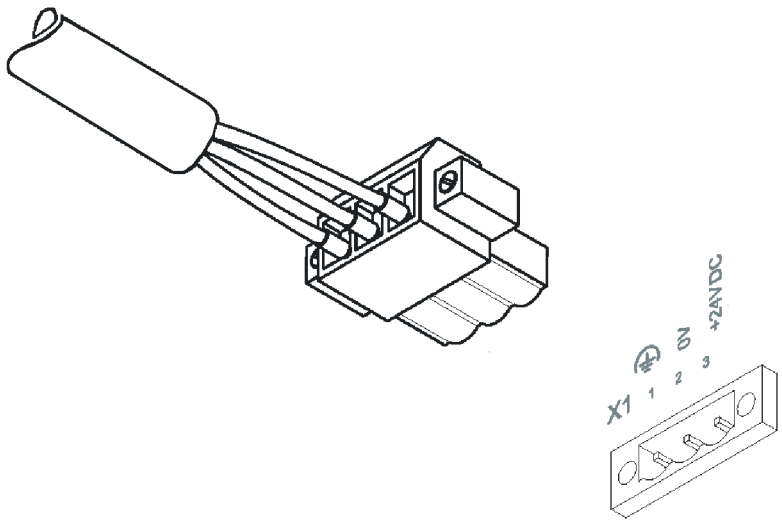


Figure 2-37 Female connector strip is plugged on

4. Secure the female connector strip in place with a screw-type locking to prevent it from slipping out.

2.4 Switching On

The Windows CE operating system is installed on the operating device. Running on the operating system is the visualization runtime.

2.4.1 Loading Procedure on Windows CE Operating Procedure

The program allows you to use the buttons to make changes to the configuration.

The operating device has 3 operating modes:

– Normal (no button is pressed)
– Setup Main (Button **Press For Setup Main Menu** was pressed)
– Administration (**Admin** button was pressed)

2.4.1.1 Launch Overview

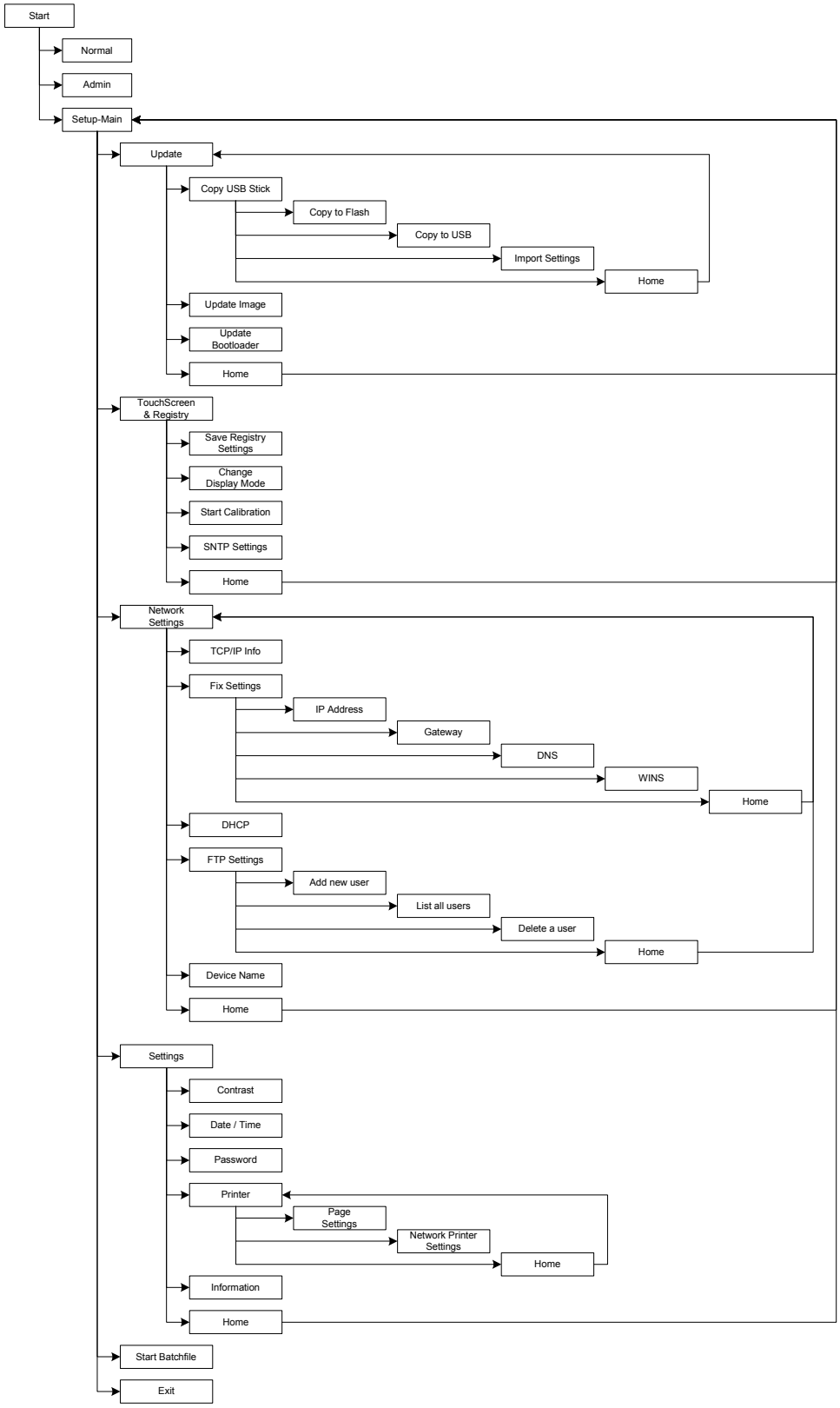


Figure 2-38 Launch overview

2.4.1.2 Normal Mode

The program AppStarter.exe starts from the internal Flash memory.

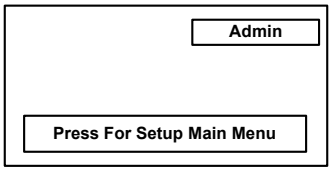


Figure 2-39 Display after startup

Please, note that the device is accessible over the Ethernet only after assignment of an IP address to the Ethernet.

2.4.1.3 Setup Main Mode

If you press the **Press For Setup Main Menu** button during the startup phase, the "Setup Main" mode starts.

Some settings are password-protected. The password is "+-+-".

Update:

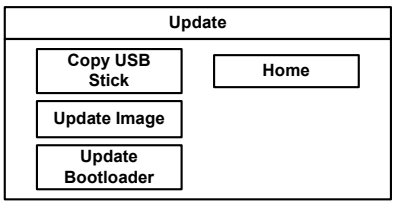


Figure 2-40 Update

Update, Copy USB-Stick:

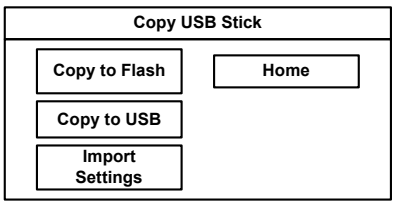


Figure 2-41 Copy USB Stick

Update, Copy USB-Stick, Copy to Flash:

This function copies the data from the USB stick to the internal flash file system.

Several projects can be managed in subdirectories below the directory TSvisRT. If more than one project is in different subdirectories, a choice dialog is displayed. Only directories which contain a project file (*.cb) are listed.

The entire TSvisRT directory or the corresponding subdirectory and the AppStarter.exe are copied into the target directory of the flash file system.

Update, Copy USB Stick, Copy to USB:

Copies the content of the flash file system to the „backup“ directory of the USB stick. This excludes protected system files. A log file is also transferred, which can be used to restore system settings via the „Import Settings“ item.

Update, Copy USB Stick, Import Settings:

An automatically generated log file can be used to restore the system settings. If the „backup“ directory of the USB stick contains a corresponding log file, these settings can be restored.
This is possible only when using identical device types.

Update, Update Image:

If the „image“ subdirectory on the USB stick contains a „*.nb0“ file, this file is used to perform the image update. There must only be one „*.nb0“ file in this directory.
In this case, the flash registry is always deactivated so that the image is processed with a new default registry.

Update, Update Bootloader:

If the „bootloader“ subdirectory on the USB stick contains a „*.nb0“ file, this file is used to perform the bootloader update. There must only be one „*.nb0“ file in this directory.
The user is informed that the update has been successfully completed.

Touch Screen & Registry:

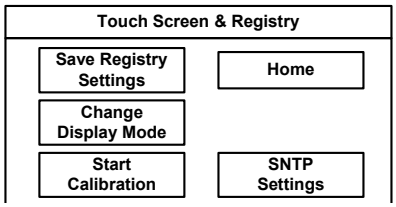


Figure 2-42 Touch Screen & Registry

Touch Screen & Registry, Save Registry Settings:

The entire registry is saved.

Touch Screen & Registry, Change Display Mode:

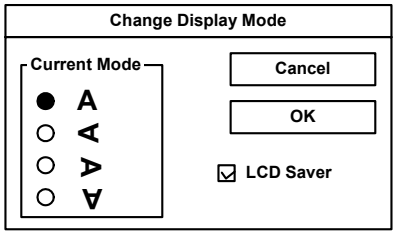


Figure 2-43 Change Display Mode

Set-up of display adjustment.

LCD Saver switches the brightness to the lowest value, if no user operation occures for at least one hour.

This entry is able to be password-protected.

Touch Screen & Registry, Start Calibration:

The touch calibration is started. After the calibration the values are stored automatically in the registry.

Touch Screen & Registry, SNTP Settings:

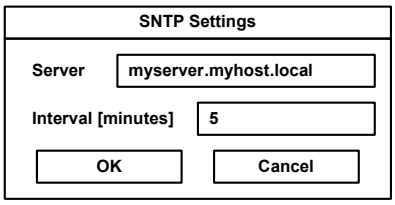


Figure 2-44 Registry, SNTP Settings

You can enter the address of a time server located in the intranet or Internet. The synchronization interval is specified in minutes.

This entry is able to be password-protected.

Network Settings:

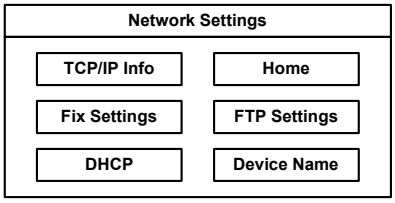


Figure 2-45 Network Settings

Network Settings, TCP/IP Info:

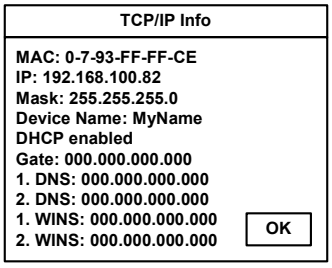


Figure 2-46 TCP/IP Info

The following informations are displayed:

- MAC address
- IP address,
- Subnet mask address,
- Device name,
- DHCP status,
- Gateway address,
- 1. DNS address,
- 2. DNS address,
- 1. WINS address,
- 2. WINS address.

Network Settings, Fix Settings, IP Address:

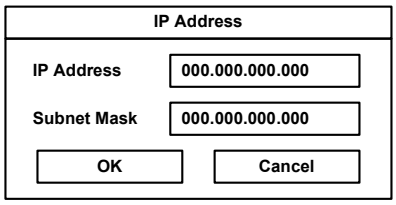


Figure 2-47 IP Address

The system automatically deselects DHCP and optionally enters the settings from the IPSetting.ini file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the IPSetting.ini file:

```
[IPCONFIG]
IPAddress=172.016.042.150
SubnetMask=255.255.255.000
```

All addresses have to be entered in the format "xxx.xxx.xxx.xxx".
Numbers smaller than 100 have to be filled up with leading zeros.
(e.g.: 192.168.42.1 -> 192.168.042.001).

Network Settings, Fix Settings, Gateway:

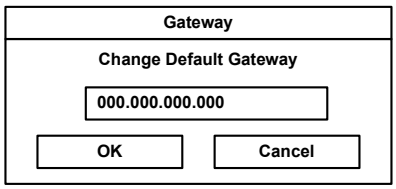


Figure 2-48 Gateway

The system automatically deselects DHCP and optionally enters the settings from the IPSetting.ini file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the IPSetting.ini file:

```
[IPCONFIG]
Gateway=172.016.042.150
```

All addresses have to be entered in the format "xxx.xxx.xxx.xxx".
Numbers smaller than 100 have to be filled up with leading zeros.
(e.g.: 192.168.42.1 -> 192.168.042.001).

Network Settings, Fix Settings, DNS:

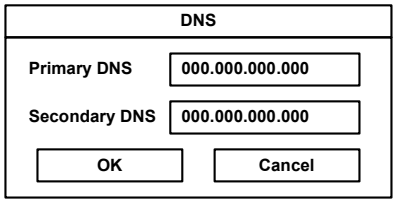


Figure 2-49 DNS

The system deselects DHCP and enters the settings from the IPSetting.ini file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the IPSetting.ini file:

```
[IPCONFIG]
PrimaryDNS=172.016.042.150
SecondaryDNS=172.016.042.151
```

All addresses have to be entered in the format "xxx.xxx.xxx.xxx".
Numbers smaller than 100 have to be filled up with leading zeros.
(e.g.: 192.168.42.1 -> 192.168.042.001).

Network Settings, Fix Settings, WINS:

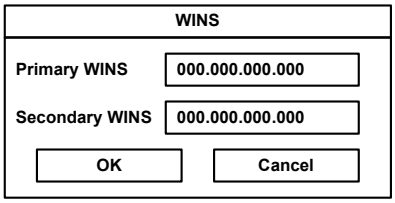


Figure 2-50 WINS

The system automatically deselects DHCP and optionally enters the settings from the IPSetting.ini file of the USB stick. This file must exist in the root directory of the USB stick.
If no USB stick is connected the information is read from the registry.

This entry is able to be password-protected.

Contents of the IPSetting.ini file:

```
[IPCONFIG]
PrimaryWINS=172.016.042.150
SecondaryWINS=172.016.042.151
```

All addresses have to be entered in the format "xxx.xxx.xxx.xxx".
Numbers smaller than 100 have to be filled up with leading zeros.
(e.g.: 192.168.42.1 -> 192.168.042.001).

Network Settings, DHCP:

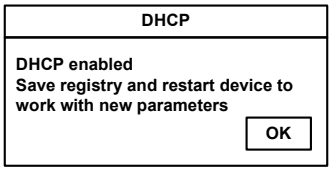


Figure 2-51 DHCP

You may enable DHCP service. You must save this setting when exiting of by using „Save Registry Settings“.

This entry is able to be password-protected.

Network Settings, FTP Settings, Add new user:

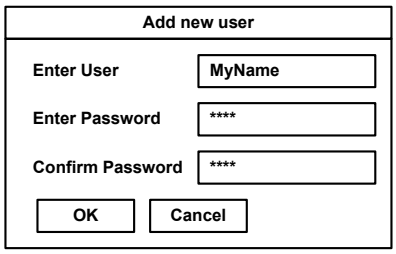


Figure 2-52 Add new user

You may enter a new user name. You have to assign a password to the user name and to confirm it.

If at least one user name is added you cannot login to the FTP server as anonymous anymore.

Network Settings, FTP Settings, List all users:

All users are listed within a DOS box.

Network Settings, FTP Settings, Delete a user:

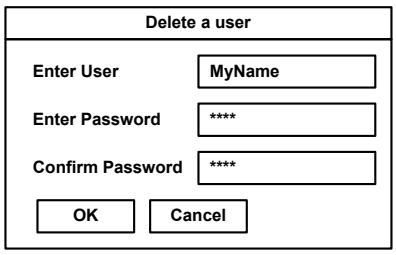


Figure 2-53 Delete a user

You may enter the user name you like to delete.

This entry is able to be password-protected.

Network Settings, Device Name:

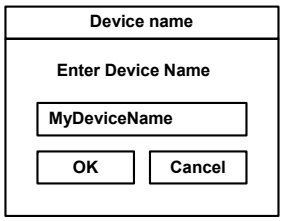


Figure 2-54 Device Name

You can define a device name with up to 14 characters. Via a FTP connection you can access the device with the device name instead of the IP address.

This entry is able to be password-protected.

Settings:

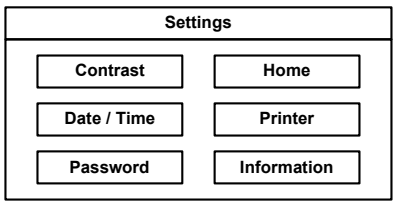


Figure 2-55 Settings

Settings, Contrast:

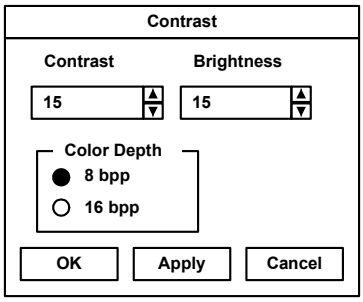


Figure 2-56 Contrast

The operating mode setup main is displayed with default values for contrast and brightness to ensure reading also at faulty values. If you change a value, you have to confirm this in a dialog. If you press **Cancel** or 5 seconds pass without any action the value is not accepted.
Depending on the display type different values can be influenced:

Table 2-2

Display Type	Contrast	Brightness
STN (mono)	X	-
STN (color)	X	X
TFT	-	X

Selection of color depth for TFT displays.

This entry is able to be password-protected.

Settings, Date / Time:

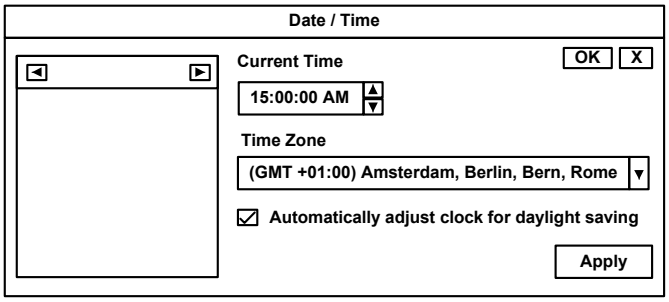


Figure 2-57 Date / Time

Set the date, time and time zone.

Settings, Password:

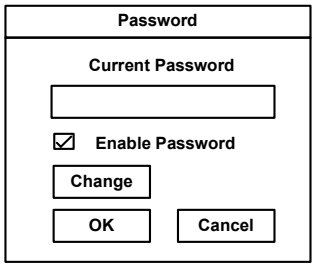


Figure 2-58 Password

The password can be activated, deactivated or redefined. When the password is activated, all password-protected dialog boxes can only be accessed if the password has been entered successfully.

This entry is able to be password-protected.

Settings, Printer:

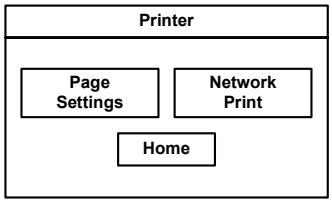


Figure 2-59 Printer

Branching to „Page Settings“ and „Network Print“.

This entry is able to be password-protected.

Settings, Printer, Page Settings:

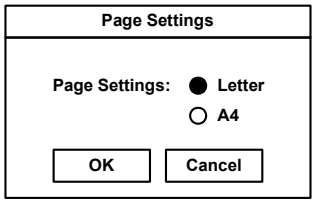


Figure 2-60 Page Settings

Select the paper format, "Letter" or "A4", "Letter" is default.

This entry is automatically stored in the registry.

Settings, Printer, Network Print:

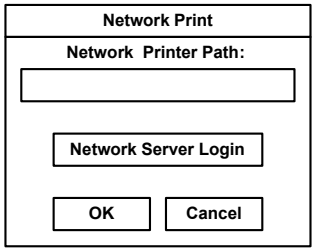


Figure 2-61 Network Print

Enter the network printer path.

This entry is automatically stored in the registry.

Settings, Printer, Network Print, Network Server Login:

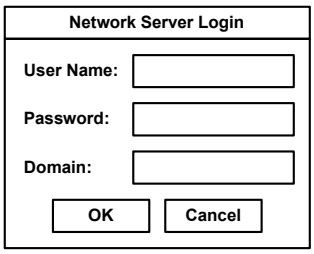


Figure 2-62 Network Server Login

You may perform a network login.

Enter a user name, password and domain.

This entry is automatically stored in the registry.

Settings, Information:

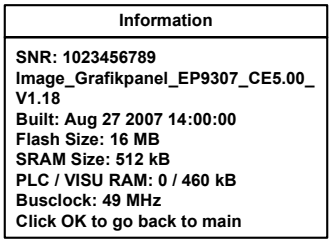


Figure 2-63 Information

The following informations are displayed:

- Serial number,
- Product ID,
- Image version,
- Built version,
- Built date,
- Size of flash,
- Size of SRAM,
- Size of PLC / Visu RAM,
- Bus clock speed.

Start Batchfile:

The **project.bat** file in the **FlashDrv** directory starts, if available.

2.4.1.4 Administration Operating Mode

If you press the **Admin** button during the startup phase, the Administration mode of operation starts.

You can use the Admin.ini file to manage the device. This file must exist in the root directory of the USB stick.

This file is used as a dongle to prevent users from changing the device during normal operation.

Possible contents for the Admin.ini file:

Observe upper and lower case for all entries!

Explorer=Off	Deactivates the Explorer in the registry. The change becomes effective on the next device reboot.
Explorer=On	Activates the Explorer in the registry. The change becomes effective on the next device reboot.
Start=explorer.exe	Starts the explorer
Start=MyProgram.exe	Starts the application MyProgram.exe Initial directory is windows. Use the following syntax to start an application on the usb stick: Start=\\\\HardDisk\\MyProgram.exe Use multiple entries to start several applications.
Registry=Default	Destroys the current registry and activates the default registry of the image. The change becomes effective on the next device reboot.
StartRepllog=On	Enables automatic startup of the Repllog.exe program in the registry. The change becomes effective on the next device reboot.
StartRepllog=Off	Disables automatic startup of the Repllog.exe program in the registry. The change becomes effective on the next device reboot.
LaunchTouch=On	The touch variant of the launch will start at devices with keyboard. The change becomes effective on the next device reboot.
LaunchTouch=Off	The standard variant for the device will start. The change becomes effective on the next device reboot.
Lock=On	The buttons **Press for Setup Main Menu** and **Admin** are disabled. If the file „Admin.ini“ is found on the usb stick the button **Admin** is enabled. Therefore the deactivation of the lock is possible. The change becomes effective on the next device reboot.
Lock=Off	All buttons enabled. The change becomes effective on the next device reboot.
Mode=Development	The shell has full functionality. The change becomes effective on the next device reboot.

Mode=Standard	The Shell is restricted: No task bar and task switch available. Desktop contains the launch icon only. The change becomes effective on the next device reboot.
DeviceName=MyName	Defines the device name of the operating device
;DeviceName=MyName	Comment, no impact

2.4.2 Function of the AppStarter.exe Program

The AppStarter.exe program creates all the necessary registry settings and can also store the registry, if desired.

If the Explorer is activated, the system shuts it down. Automatic startup of ActiveSync is also deactivated.

The AppStarter.exe file then starts the TSvisLD_CE.exe file from the Flash File System (FFS).

2.4.3 Function of the TSvisLD.exe Program

The TSvisLD.exe loads the following components into the memory of the operating system in accordance with the instructions in the TSvisRT_CE.ini file:

– User application
– Protocol driver
– TSvisRT firmware

The program then unpacks the compressed application file (*.CB) and starts the TSvisRT Runtime component.

2.4.4 Memory Media Used

The following memory media are used:

Table 2-3 Memory media used

Operating system memory TSvisRT Runtime Protocol driver Application		**Flash file system** **(FlashDrv)** AppStarter.exe Subdirectory TSvisRT\Project name (with TSvisRT Runtime, protocol driver and application)		USB stick (Hard disk)
		Registry settings		Admin.ini IPSetting.ini
		Image storage in Flash		Subdirectory Image
		Bootloader storage in Flash		Subdirectory Bootloader

Legend:

Copying carried out by operating system

Copying carried out by the bootloader

Copying carried out by the Launch.exe

2.4.5 Important Files and Update

Table 2-4 Important files and update

File	Storage location	Update	Function
TSvisRT_CE.INI	Subdirectory **TSvisRT** or **TSvisRT\Projekt** on USB stick	Transfer via programming software on USB stick or FTP server	Initialization file for TSvisLD_CE.exe
SPSTtxxxxxxx.yyy.DLL	Subdirectory **TSvisRT** or **TSvisRT\Projekt** on USB stick	Transfer via programming software on USB stick or FTP server	Protocol driver
*.CB	Subdirectory **TSvisRT** or **TSvisRT\Projekt** on USB stick	Transfer via programming software on USB stick or FTP server	Compressed application file
TSvisRT_CE.EXE	Subdirectory **TSvisRT** or **TSvisRT\Projekt** on USB stick	Transfer via programming software on USB stick or FTP server	TSvisRT Runtime
*.nb0	Subdirectory **Bootloader**	Menu item "Update Bootloader" in operating mode setup main via USB stick	Windows CE Bootloader
*.nb0	Subdirectory **Image**	Menu item "Update Image" in operating mode setup main via USB stick	Operating system Windows CE
AppStarter.EXE	**Root directory** on USB stick	Menu item "Copy USB Stick" in operating mode setup main via USB stick	Starts TSvisLD_CE.exe
TSvisLD_CE.EXE	Subdirectory **TSvisRT** or **TSvisRT\Projekt** on USB stick	Menu item "Copy USB Stick" in operating mode setup main via USB stick	TSvisRT loader
Admin.INI	**Root directory** on USB stick	-	File with administration settings
IPSetting.INI	**Root directory** on USB stick	-	File with settings for IP assignment
starter.bat	**Root directory** on FlashDrv	-	Starts a user-defined application on startup
project.bat	**Root directory** on FlashDrv		Starts a user-defined application from within the launcher

2.5 Identification

The operating device can be identified using the nameplate on the rear of the device.

Figure 2-64 Nameplate (example)

1 Order number
2 Version key (at time of delivery)
3 MAC address
4 Voltage and power specification
5 Serial number

2.5.1 Version Key

The version key provides information on the version level of various components at time of delivery.

3 Control and Display Elements

3.1 Display

DANGER: Toxic
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

DANGER: Corrosive
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

NOTICE: Damage
Static screen parts which displayed over a longer time period (> 1 hour) may result in so-called image sticking.
Image sticking shows itself visual like a „burn-in effect“. The screen displayed before remains visible after a change of image as shade furthermore. Higher environmental temperatures during the operation can accelerate this effect. To avoid the danger of an irreversible damage, the display must time controlled - 15 minutes are recommended - set with a black screen. Image sticking is a technologically property and only can be prevented by a suitable application. Image sticking is not appreciated by display suppliers as a guarantee reason.

Please follow the instructions in the programming software's help topic "How do I configure a black screen as a screen saver" for making such a screen.

The operating device is equipped with different displays depending on variant.

3.1.1 Touch Screen

The device is equipped with a resistive 4 wire touch screen. You operate the device using this touch screen.

NOTICE: Damage
Pointed or sharp objects, such as pens or fingernails, can lead to irreparable damages of the touch screen. Exclusively therefore use the fingertips or the aids indicated in the technical data for the operation.

NOTICE: Damage
To protect the touch screen you can use special protection foils. You receive corresponding protection foils directly from Sütron electronic.

4 Interfaces of the Device

4.1 Standard Interfaces

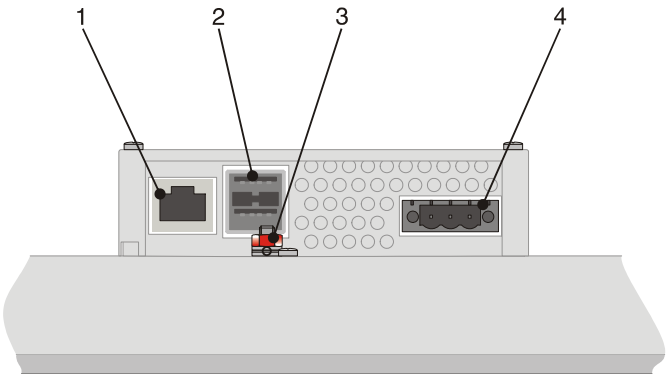


Figure 4-1 Rear view Ethernet

1 Female Connector X5 (Ethernet)
2 Female Connector X9, X10 (USB Host - Type A)
3 Threaded Bolt for Protective Grounding
4 Connector X1 (Supply Voltage)

4.1.1 Ethernet (X5)

A 10/100 Base-T Ethernet interface is located at the operating device.

4.1.1.1 Pin Assignment

Connector in the operating device: RJ45 female connector.

Table 4-1 Assignment of the Ethernet interface

Pin	Designation	Function
1	Tx+	Transmitted Data, Positive Polarity
2	Tx-	Transmitted Data, Negative Polarity
3	Rx+	Received Data, Positive Polarity
4	n.c.	Not Connected
5	n.c.	Not Connected
6	Rx-	Received Data, Negative Polarity
7	n.c.	Not Connected
8	n.c.	Not Connected

4.1.1.2 Cable

NOTICE
A twisted pair cable of the category 5 (CAT 5) type must be used. The maximum cable length is 100 m (328.084 feet).

See the IEEE 802.3 standard for further information.

4.1.1.3 Diagnostics

Ethernet diagnostics LEDs are located at the operating device.

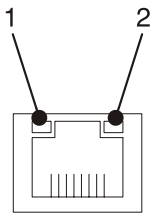


Figure 4-2 Position of the ethernet diagnostics LEDs

Table 4-2 Function of the ethernet diagnostics LEDs

No.	Color	State	Designation	Function
1	Green	ON	XMT	Sending ethernet data telegram
2	Yellow	ON	RCV	Receiving ethernet data telegram

4.1.2 USB (X9, X10)

Two host interfaces are available on the operating device.

NOTICE
Using the USB interfaces while normal operating mode is not permitted for maritime applications!
For maritime applications the use of the USB interfaces is allowed for servicing operations only!

NOTICE
Using input devices not suitable for industrial use (e.g. keyboard, mouse) may decrease safety of operation. This includes input devices intended for home and office use.

4.1.2.1 Cable

For the specification of a suitable cable, please refer to the „Universal Serial Bus Specification Rev. 2.0“.

NOTICE
The maximum cable length for the cable used is 2.5 m (8.202 feet).

5 Maintenance and Servicing

5.1 Front Panel

Only use a damp cloth to remove any dirt from the front panel.

5.2 Fuse

NOTICE: Damage
The semiconductor fuse cannot be replaced!

A semiconductor fuse is used to protect the device. Once the fuse has been tripped, the device must be disconnected from the supply voltage to allow the semiconductor fuse to regenerate. At an ambient temperature of 20 °C (68 °F), the regeneration takes approximately 20 seconds. The higher the ambient temperature, the longer the regeneration takes.

5.3 Battery

The built-in battery preserves the data in the SRAM and supplies the real-time clock with power. The minimum battery life is 5 years, even under unfavorable operating conditions. When the battery runs down, the message "Change battery" is generated automatically.

We recommend you change the battery approximately every 4 years as part of the regular maintenance work. A prepared battery including connector can be obtained directly from Sütron electronic.

If the "Change battery" message is detected too late, data in the SRAM may have already been lost. For this reason, after changing a battery, always check data such as editable passwords, parameters in the system variables, data sets of the recipes and entries in the message system.

5.3.1 Changing the Battery

CAUTION: Explosive
Do not throw lithium batteries into fire, do not heat to 100 °C or higher and do not recharge.

CAUTION: Toxic
Do not open lithium batteries.

NOTICE: Damage
Batteries must only be changed by authorized and trained experts!

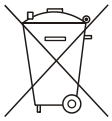
NOTICE: Damage
For changing the battery you may only use replacement batteries of Sütron electronic.

NOTICE: Damage
Electrostatic discharge can damage electronic components. Observe the ESD protective measures!

To ensure that the data in the SRAM and the time are preserved, it is possible to change the battery under operating voltage. Observe the corresponding safety notices!

1. Remove the screws on the rear of the device and lift off the enclosure cover.
2. Remove the glue strip securing the battery.
3. Disconnect the connector from the battery and remove the dead battery.
4. Plug in the cable for the new battery.
5. Use a glue strip to attach the new battery to the enclosure.
6. Place the enclosure cover back onto the device.
7. Carefully tighten the screws of the enclosure cover.

5.3.2 Battery Disposal



The manufacturer is obliged to mark batteries with this symbol before first placing into market. The symbol is extended by the chemical symbols if the following limiting values are exceeded:

More than 0.0005 mass percent mercury	Hg
More than 0.002 mass percent cadmium	Cd
More than 0.004 mass percent lead	Pb

Batteries can be given back free of charge after use at the place of purchase.

According to the §11 of the battery law, final consumers are obligedly to give old batteries back to gathering points which attached to the common take back system or manufacturer-specific take back systems.

NOTICE: Damage
To prevent short circuitry in the collection boxes, insulate the poles of each battery with insulation tape or put each single battery into a plastic bag.

6 Technical Data

6.1 Generally

Touch Screen	
Type	Analog resistive, 4 wire technology
Activation force	15 g (Standard) With R8 HS60 silicon rubber
Durability	No damages or malfunctions after 3 million keystrokes as the following: Keystroke element: R8, HS40 silicon rubber Keystroke load: 150 g Keystroke frequency: 3 Hz

Ethernet	
X5 Ethernet	10/100 Base-T

USB	
Corresponds to the „Universal serial bus specification Rev. 2.0“	
X9, X10 Host	Min.: 1.5 Mbit/s Max.: 12 Mbit/s Max. output current 100 mA per output

Central Processing Unit	
Central processing unit	RISC ARM9
Clock frequency	200 MHz
Other features	Watchdog timer, real-time clock, battery monitoring

Memory	
Application memory (option)	3 MByte (14 MByte)
Flash (option)	16 MByte (32 MByte)
SDRAM (option)	32 MByte (64 MByte)
SRAM (option)	512 KByte (512 KByte)

Connection System
Female and male connector strips Phoenix COMBICON, 3 pin
RJ45 female connector
USB female connector A

Environmental Conditions	
Temperature during operation	0 °C to 50 °C (32 °F to 122 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (-13°F to + 158°F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 1, overvoltage category II

Standards and Guidelines	
Interference immunity	DIN EN 61000-4-2 DIN EN 61000-4-3 DIN EN 61000-4-4 DIN EN 61000-4-5 DIN EN 61000-4-6 DIN EN 61000-6-2
Emitted interference	DIN EN 55011 limit value class A DIN EN 55022 limit value class A DIN EN 61000-6-4
Equipment requirements	DIN EN 61131-2
Storage and transportation	DIN EN 61131-2
Power supply	DIN EN 61131-2
Electromagnetic compatibility	2004/108/EG
Degrees of protection	DIN EN 60529
Impact load, shocks	DIN EN 60068-2-27
Sinusoidal vibrations	DIN EN 60068-2-6

NOTICE: Radio Interference
This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

6.2 TPM11AM

Display	
Type	FSTN (mono)
Resolution (pixels)	320 x 240
Colors	5 Shades of gray
Reading angle (vertical / horizontal)	80° / 80°
Contrast setting	Temperature compensated
Half-life backlighting	30,000 h
Brightness in cd/m^2	90
Display area (H x W) in mm (Inch)	57.6 x 76.8 (2.268 x 3.024)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.25 A
Power consumption (maximum)	0.35 A
Connected load	6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	96 x 130 x 5 (3.78 x 5.118 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	88 x 122 (3.465 x 4.803)
Mounting depth in mm (Inch)	About 33 (1.299) Standard / Field Bus Interface: About 45 (1.772)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 500 g

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.3 TPM11AT

Display	
Type	TFT (color)
Resolution (pixels)	320 x 240
Colors	65536
Reading angle (vertical / horizontal)	140° / 140°
Half-life backlighting	30,000 h
Brightness in cd/m^2	320
Display area (H x W) in mm (Inch)	53.6 x 71.5 (2.11 x 2.815")

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.2 A
Power consumption (maximum)	0.3 A
Connected load	4.8 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	96 x 130 x 5 (3.78 x 5.118 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	88 x 122 (3.465 x 4.803)

Front Panel and Enclosure	
Mounting depth in mm (Inch)	About 33 (1.299) Standard / Field Bus Interface: About 45 (1.772)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 500 g

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.4 TPM21AM

Display	
Type	FSTN (mono)
Resolution (pixels)	320 x 240
Colors	5 Shades of gray
Reading angle (vertical / horizontal)	90° / 80°
Contrast setting	Temperature compensated
Half-life backlighting	40,000 h
Brightness in cd/m^2	120
Display area (H x W) in mm (Inch)	86.4 x 115.2 (3.402 x 4.535)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.25 A
Power consumption (maximum)	0.35 A
Connected load	6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	147 x 203 x 5 (5.787 x 7.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	139 x 195 (5.7472 x 7.677)
Mounting depth in mm (Inch)	About 54 (2.126) Standard / Field Bus Interface: About 66 (2.598)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1000 g

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.5 TPM21AS

Display	
Type	C-STN (color)
Resolution (pixels)	320 x 240
Colors	256
Reading angle (vertical / horizontal)	60° / 100°
Contrast setting	Temperature compensated
Half-life backlighting	50,000 h
Brightness in cd/m^2	200
Display area (H x W) in mm (Inch)	86.4 x 115.2 (3.402 x 4.535)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.4 A
Power consumption (maximum)	0.5 A

Electrical Data (Forts.)	
Connected load	9.6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	147 x 203 x 5 (5.787 x 7.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	139 x 195 (5.7472 x 7.677)
Mounting depth in mm (Inch)	About 54 (2.126) Standard / Field Bus Interface: About 66 (2.598)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1000 g

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.6 TPM21AT

Display	
Type	TFT (color)
Resolution (pixels)	320 x 240
Colors	65536
Reading angle (vertical / horizontal)	105° / 130°
Half-life backlighting	50,000 h
Brightness in cd/m^2	400
Display area (H x W) in mm (Inch)	86.4 x 115.2 (3.402 x 4.535)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V

Electrical Data (Forts.)	
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.4 A
Power consumption (maximum)	0.6 A
Connected load	9.6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	147 x 203 x 5 (5.787 x 7.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	139 x 195 (5.7472 x 7.677)
Mounting depth in mm (Inch)	About 54 (2.126) Standard / Field Bus Interface: About 66 (2.598)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1000 g

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.7 TPM35AM

Display	
Type	TFT (mono)
Resolution (pixels)	320 x 240
Colors	256 Shades of gray
Reading angle (vertical / horizontal)	150° / 130°
Half-life backlighting	40,000 h
Brightness in cd/m^2	220
Display area (H x W) in mm (Inch)	52.5 x 70 (2.066 x 2.755)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.3 A
Power consumption (maximum)	0.4 A
Connected load	7.2 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	90 x 120 x 5 (3.543 x 4.724 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	82 x 112 (3.228 x 4.409)
Mounting depth in mm (Inch)	About 35 (1.377) Standard / Field Bus Interface: About 47 (1.85)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 430 g

Approvals
CE, UL, cUL, GL

6.8 TPM35AT

Display	
Type	TFT (color)
Resolution (pixels)	320 x 240
Colors	65536
Reading angle (vertical / horizontal)	150° / 130°

Display	
Half-life backlighting	40,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	52.5 x 70 (2.066 x 2.755)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.3 A
Power consumption (maximum)	0.4 A
Connected load	7.2 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	90 x 120 x 5 (3.543 x 4.724 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	82 x 112 (3.228 x 4.409)
Mounting depth in mm (Inch)	About 35 (1.377) Standard / Field Bus Interface: About 47 (1.85)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 430 g

Approvals
CE, UL, cUL, GL

6.9 TPM43AT

Display	
Type	TFT (color)
Resolution (pixels)	480 x 272
Colors	65536
Reading angle (vertical / horizontal)	120° / 150°
Half-life backlighting	40,000 h
Brightness in cd/m^2	450
Display area (H x W) in mm (Inch)	53.8 x 95 (2.118 x 3.74)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.3 A
Power consumption (maximum)	0.4 A
Connected load	7.2 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	100 x 140 x 5 (3.937 x 5.511 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	92 x 132 (3.622 x 5.196)
Mounting depth	About 42 (1.654) Standard / Field Bus Interface: About 54 (2.126)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 590 g

Approvals
CE, UL, cUL, GL

6.10 TPM57AM

Display	
Type	TFT (mono)
Resolution (pixels)	320 x 240
Colors	256 Shades of gray
Reading angle (vertical / horizontal)	135° / 150°
Half-life backlighting	40,000 h
Brightness in cd/m^2	250
Display area (H x W) in mm (Inch)	86.4 x 115.2 (3.402 x 4.535)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.4 A
Power consumption (maximum)	0.6 A
Connected load	9.6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	126 x 168 x 5 (4.961 x 6.614 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	118 x 160 (4.646 x 6.299)

Front Panel and Enclosure	
Mounting depth	About 42 (1.654) Standard / Field Bus Interface: About 54 (2.126)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 690 g

Approvals
CE, UL, cUL, GL

6.11 TPM57AT

Display	
Type	TFT (color)
Resolution (pixels)	320 x 240
Colors	65536
Reading angle (vertical / horizontal)	135° / 150°
Half-life backlighting	40,000 h
Brightness in cd/m^2	400
Display area (H x W) in mm (Inch)	86.4 x 115.2 (3.402 x 4.535)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.4 A
Power consumption (maximum)	0.6 A
Connected load	9.6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	126 x 168 x 5 (4.961 x 6.614 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	118 x 160 (4.646 x 6.299)
Mounting depth in mm (Inch)	About 42 (1.654) Standard / Field Bus Interface: About 54 (2.126)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 690 g

Approvals
CE, UL, cUL, GL

6.12 TPM70AT

Display	
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	65536
Reading angle (vertical / horizontal)	100° / 100°
Half-life backlighting	50,000 h
Brightness in cd/m^2	400
Display area (H x W) in mm (Inch)	91.4 x 152.4 (3.598 x 6.0)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.5 A
Power consumption (maximum)	0.7 A

Electrical Data (Forts.)	
Connected load	12 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	147 x 203 x 5 (5.787 x 7.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	139 x 195 (5.7472 x 7.677)
Mounting depth in mm (Inch)	About 54 mm (2.126") Standard / Field Bus Interface: About 66 mm (2.598")
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1000 g

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.13 TPM90AT

Display	
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	65536
Reading angle (vertical / horizontal)	170° / 170°
Half-life backlighting	50,000 h
Brightness in cd/m^2	240
Display area (H x W) in mm (Inch)	199 x 121 (7.835 x 4.764)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V

Electrical Data (Forts.)	
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.6 A
Power consumption (maximum)	0.8 A
Connected load	14.4 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	172 x 260 x 5 (6.772 x 10.236 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	164 x 252 (6.456 x 9.921)
Mounting depth in mm (Inch)	About 54 (2.126) Standard / Field Bus Interface: About 66 (2.598)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1300 g

Approvals
CE, UL, cUL, GL

6.14 TPM104AT

Display	
Type	TFT (color)
Resolution (pixels)	640 x 480
Colors	65536
Reading angle (vertical / horizontal)	110° / 140°
Half-life backlighting	50,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	158 x 211 (6.22 x 8.307)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.6 A
Power consumption (maximum)	0.8 A
Connected load	14.4 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	249 x 328 x 5 (9.803 x 12.913 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	222 x 303 (8.740 x 11.929)
Mounting depth in mm (Inch)	About 55 (2.165) Standard / Field Bus Interface: About 67 (2.638)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 2300 g

Approvals
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.15 TPM105AT

Display	
Type	TFT (color)
Resolution (pixels)	800 x 600
Colors	65536
Reading angle (vertical / horizontal)	110° / 140°

Display	
Half-life backlighting	50,000 h
Brightness in cd/m^2	330
Display area (H x W) in mm (Inch)	158 x 211 (6.22 x 8.307)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.6 A
Power consumption (maximum)	0.8 A
Connected load	14.4 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	220 x 295 x 5 (8.661 x 11.614 x 0.196)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	212 x 287 (8.346 x 11.299)
Mounting depth in mm (Inch)	About 55 (2.165) Standard / Field Bus Interface: About 67 (2.638)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1800 g

Approvals
CE, UL, cUL, GL

6.16 TPM120AT

Display	
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	65536
Reading angle (vertical / horizontal)	130° / 130°
Half-life backlighting	50,000 h
Brightness in cd/m^2	280
Display area (H x W) in mm (Inch)	262 x 157 (10.315 x 6.181)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	0.7 A
Power consumption (maximum)	0.9 A
Connected load	16.8 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	225 x 330 x 5 (8.858 x 12.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	217 x 322 (8.543 x 12.677)
Mounting depth in mm (Inch)	About 54 (2.126) Standard / Field Bus Interface: About 66 (2.598)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1900 g

Approvals
CE, UL, cUL, GL

6.17 TPM151AT

Display	
Type	TFT (color)
Resolution (pixels)	1024 x 768
Colors	256
Reading angle (vertical / horizontal)	135° / 160°
Half-life backlighting	50,000 h
Brightness in cd/m^2	480
Display area (H x W) in mm (Inch)	228 x 304 (8.976 x 11.969)

Electrical Data	
Supply voltage	24 V DC (SELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Minimum voltage	18 V
Maximum voltage	30 V
Power consumption (typical at 24 V)	1.0 A
Power consumption (maximum)	1.2 A
Connected load	24 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, anodized natural finish
Front panel (H x W x D) in mm (Inch)	329 x 400 x 5 (12.953 x 15.748 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	303 x 374 (11.929 x 14.724)

Front Panel and Enclosure	
Mounting depth in mm (Inch)	About 60 (2.362) Standard / Field Bus Interface: About 72 (2.835)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 2300 g

Approvals
CE, UL, cUL, GL

7 Ordering Data

Table 7-1 Accessories

Description	Part No.
USB 2.0 stick 1 GB	81152.100
USB 2.0 stick 2 GB	81152.200
USB 2.0 stick 8 GB	81152.800
Battery, assembled with cable and connector (Type: CR2450)	66779.000
Protective foil for touch screen 3.5" (Set with 10 protective foils, scraper and instructions))	81251.035
Protective foil for touch screen 3.8" (Set with 10 protective foils, scraper and instructions)	81251.038
Protective foil for touch screen 4.3" (Set with 10 protective foils, scraper and instructions)	81251.043
Protective foil for touch screen 5.7" (Set with 10 protective foils, scraper and instructions)	81251.058
Protective foil for touch screen 7" (Set with 10 protective foils, scraper and instructions)	81251.070
Protective foil for touch screen 9" (Set with 10 protective foils, scraper and instructions)	81251.090
Protective foil for touch screen 10.5" (Set with 10 protective foils, scraper and instructions)	81251.104
Protective foil for touch screen 12" (Set with 10 protective foils, scraper and instructions)	81251.120
Protective foil for touch screen 15" (Set with 10 protective foils, scraper and instructions)	81251.150

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